TECHNOLOGY DEPT.

RUBBER WORLD

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SIR GEOFFREY CLAY, MALAYA'S CONTROLLER OF RUBBER RESEARCH, VISITING THE U.S.A. TO LEARN NEEDS OF AMERICAN CONSUMER; OUR PROGRESS WITH SYNTHETIC RUBBER

Page 749

AUGUST, 1959

Mooney Cure Tests for Calculating Curing Times

By A. E. Juve, B. F. Goodrich Co.

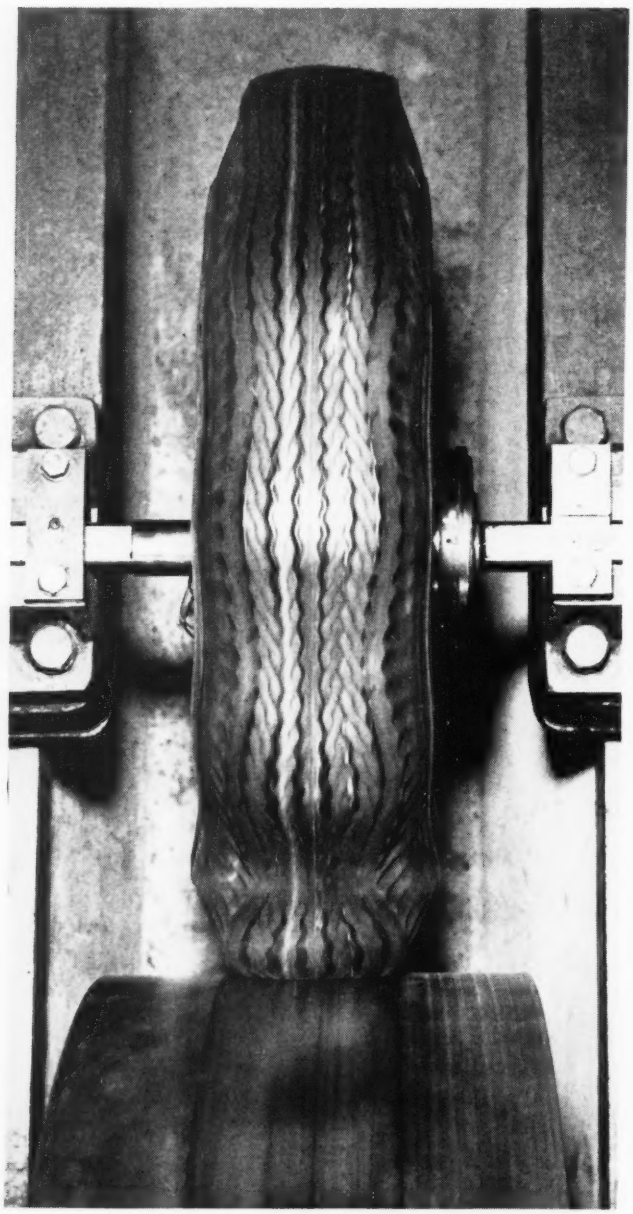
See page 705

A BILL BROTHERS PUBLICATION

From Du Pont...

THERMOFLEX A

...for heat degradation and flex-cracking resistance



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RUBBER WORLD

ARTICLE HIGHLIGHTS

THE GROWING CHALLENGE OF MARKETING RUBBER

Large numbers of competitive polymer types and increased production and selling costs are among the problems challenging not only producers of synthetic, but also of natural rubber in the coming decade. **703**

CAN USE MOONEY FOR CURE OPTIMUMS

An expanded and revised method for using a continuation of the Mooney scorch test for setting "optimum" or determining "equivalent" cure times is presented as a refinement on a method first proposed in 1915. **705**

CONTINUOUS URETHANE FOAM UNIT DESCRIBED

The problems involved in producing molded urethane foam on a continuous basis have been identified and solved in the pilot unit described in this paper. **711**

SPECIAL VALUE OF ATTRIBUTE CONTROL CHARTS

Attribute control charts, because they are expressed in percentages, are valuable for use with all production personnel. Their mere presence may aid in improving quality consciousness and product quality. **717**

NEW ADVANCES IN TESTING

A new and better air aging oven, improved technique for Mooney viscosity detailed before ASTM Committee D-11 at its June meeting in Atlantic City. More than 20 subcommittees reported on their latest work. **723**

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VOLUME 140, NUMBER 5 AUGUST, 1959

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Cover photo: Courtesy of Natural Rubber Bureau

The opinions expressed by our contributors do not necessarily reflect those of our editors

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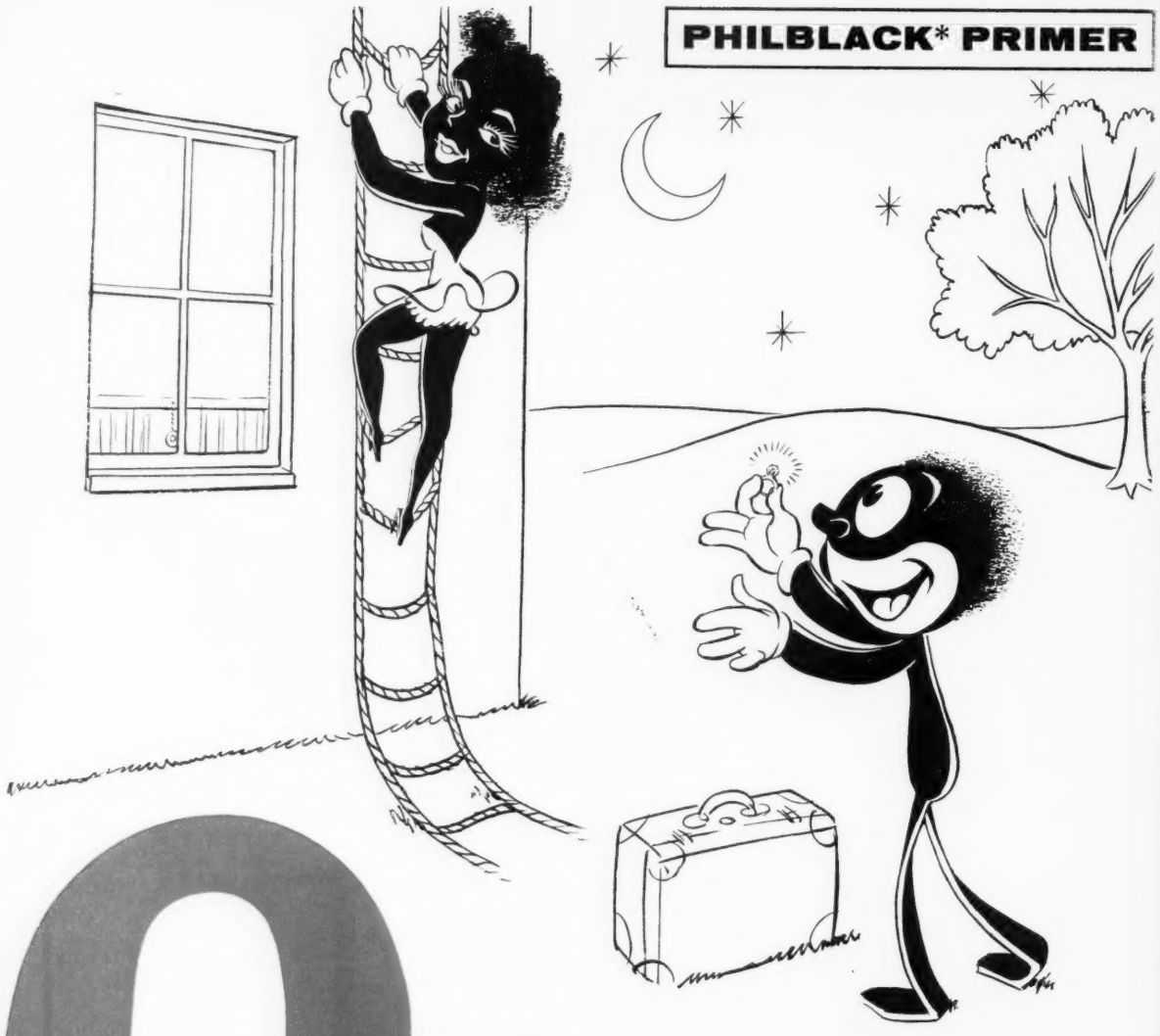

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The government's natural rubber stockpile rotation program, suspended during most of July for lack of funds, will probably be reactivated on a reduced scale when a compromise agreement is worked out between the House and Senate Appropriation committees in August.

Sir Geoffrey Fletcher Clay, Malaya's Controller of Rubber Research & Development, is inquiring the needs of American natural rubber consumers, observing our progress in synthetic rubber, and making plans for more effective competition, during his July-August visit. Leong Hoe Yeng, of the Rubber Producers' Council and a member of the Federal Legislature of Malaya, preceded Sir Geoffrey on a separate visit in July to meet with rubber industry executives also.

E. A. O'Keefe, Texas-U. S. Chemical Co. president, indicated some of the marketing problems facing synthetic rubber producers in the coming decade in a talk in New York in June. The natural rubber producers face many similar, if not identical, problems.

Goodyear Tire & Rubber Co. and United States Rubber Co. will meet with the United Rubber Workers union in mid-August to begin negotiations on a "general wage increase." Both sides appear to be widely separated in their views on this subject. Canada's Polymer Corp., Ltd., 97-day strike was settled on June 23.

The U. S. State Department has reaffirmed its position that export licenses will not be granted for the shipment of synthetic rubber production equipment and know-how to Russia.

Columbian Carbon Co. will build a $6-million, 60-million-pound-a-year carbon black plant in Milan, Italy. Japanese Geon, in which B. F. Goodrich holds an interest, began synthetic rubber production in a plant near Yokohama recently. Dow Badische Chemical Co. will produce acrylic acid and esters in a plant near Freeport, Tex., in 1960.

NEWS from ABROAD

First Synthetic Rubber Plant On-Stream in Japan

The first synthetic rubber plant to begin production in Japan was formally opened recently in Kawasaki by officials of The B. F. Goodrich Co., Akron, O., and Japanese Geon, Ltd., Tokyo.

The $1.3 million plant, with a capacity for producing 8,400 tons of rubber a year, is owned by Japanese Geon, an associate company in which BFG holds an interest. It was designed and built under the supervision of the B. F. Goodrich Chemical Co.

Arthur Kelly, executive vice president of BFG, and M. W. Larson, of the chemical company's international department, were present for the opening ceremonies. The plant is designed so that its capacity can be expanded to 15,000 tons a year, according to Kelly. It will produce general-purpose rubber for tires and industrial products and special-purpose rubber for use in applications requiring resistance to oil, gasoline, and chemicals.

The plant, located about 100 miles from Yokohama, is the third manufacturing facility to be erected by Japanese Geon. The company has vinyl resin production facilities at Kambara and Takoaka.

Curing Aerosil Stocks

Research at the rubber division of the Technical Institute, Hannover, on the kinetics of vulcanization of highly elastic polymers, hitherto confined to unfilled polymers, has now been extended to compounds prepared with active fillers. Scheele and associates report[1] on the kinetics of thiuram vulcanization of natural rubber compounds prepared with 5 grams of ZnO (active) and 5 to 10 grams of the silica filler, Aerosil, per 100 grams of the mix.

Results obtained so far indicate that Aerosil has no effect on the chemistry of thiuram vulcanization, or on fundamental kinetics. It has no reinforcing effect. On the other hand, its presence resulted in a remarkable increase in the rate of thiuram vulcanization so that its effect is chiefly that of strong catalytic action.

The authors stress that the discovery of the greatly increased rate at which thiuram decreases and dithiocarbaminate is formed in presence of Aerosil — which they consider of practical as well as scientific importance—would not have been possible without the preceding, thorough research on pure thiuram vulcanization on which they had been engaged. The investigations on Aerosil are to be continued.

[1] *Kautschuk u. Gummi*, Feb., 1959, WT 33.

Malaya Has June Price Drop, Stockpile Worry

Rubber plantation workers did not long enjoy the raise they received in June because the average price for rubber in the preceding month had topped one dollar. The average for June fell below that level, and basic wages were cut accordingly during July. Tappers, however, can make up at least part of the difference if they bring in more rubber.

The drop in the price average in June was due to the uncertainties over the disposition to be made with regard to the stockpile in the United States. Russia, which had been the best customer in the local market, buying more here in the first five months of the current year than in all of 1958 (85,568 tons, against 68,436 tons in 1958) was not active enough after May to offset the downward trend. Nor did the seasonal increase in rubber production, which pushed the May figure 15½% above that for April, help matters.

Discussing the American and British stockpiles editorially, the *Malay Mail* quotes the *London Economist* as saying:

"Instead of trying to discourage the United States Administration from disposing of its surplus stocks, foreign producers and their governments should accept that disposal is their problem too. They should insist not only on full consultation with the Administration, but should try to play a part in working out plans for disposal. The difficulties do not grow any lighter by being left alone."

Then contemplating the stockpiles in the United States and in Britain, put at 1,250,000 tons and 125,000 tons, respectively, the *Malay Mail* suggests:

"This vast supply of surplus rubber might well offer, if consuming governments are agreeable to co-operate in its disposal, a chance to experiment with a ready-made buffer stock which would, however, work only one way. This might not be too bad a thing, for all estimates as to future consumption point to natural rubber being in short supply and therefore vulnerable to synthetic in the future."

French Butyl Latices

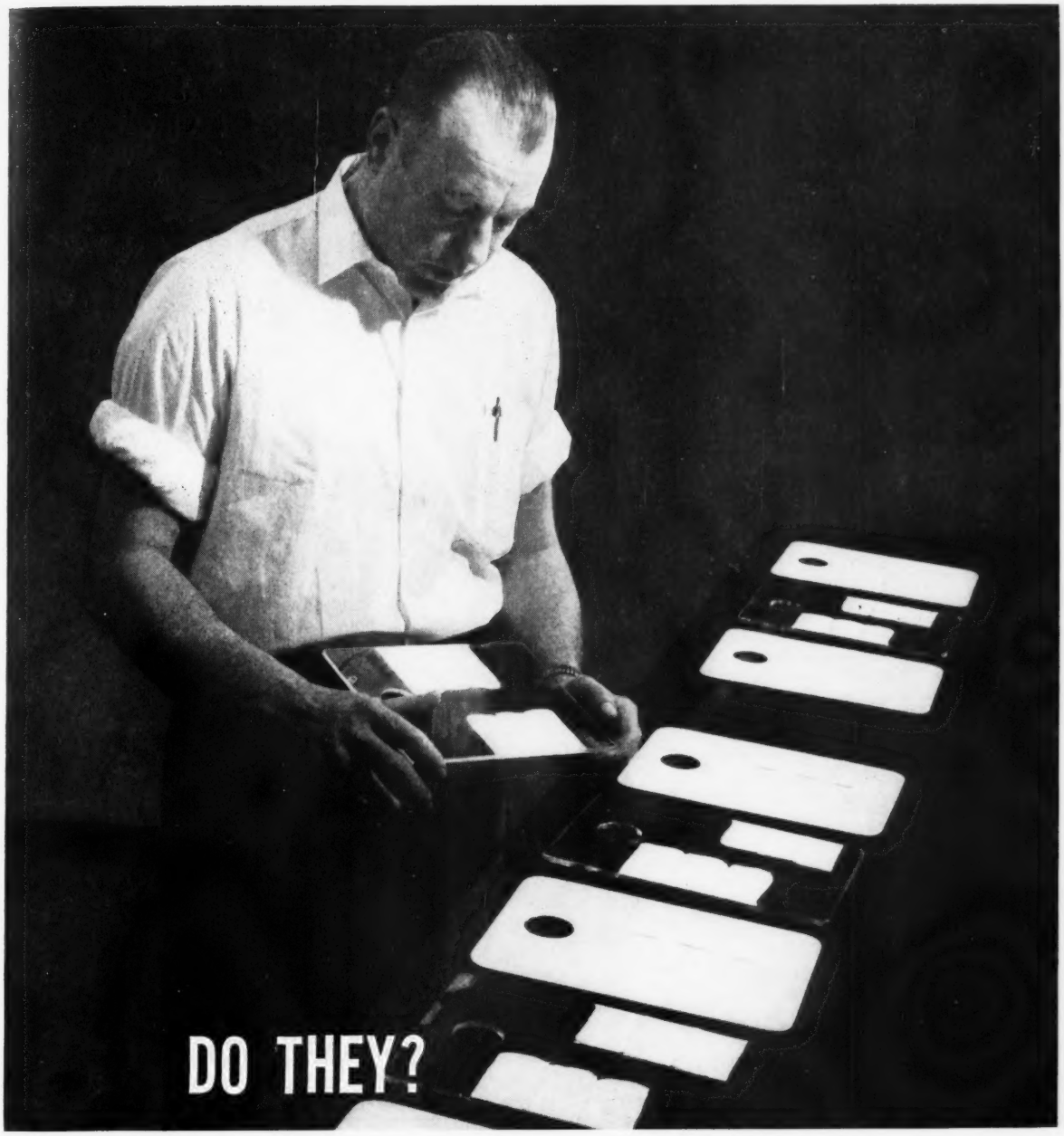
An aqueous emulsion of butyl rubber is now being prepared by the organic chemistry department of St. Gobain, Paris, France, according to relatively simple and inexpensive methods as are used for emulsions of natural and synthetic resins. The butyl emulsion is alkaline and has a dry content of about 50%; this emulsion is claimed to be physically and mechanically stable even when very much diluted, to be non-toxic, non-flammable, film-forming, adherent, and odorless. Viscosity can be regulated by simple dilution; while certain organic solvents, synthetic or natural resins, and curing agents may be added without flocculation.

The films obtained after drying resist water and oxygenated solvents, but dissolve in aromatic and chlorinated solvents. The good resistance to aging and chemical agents is further enhanced by vulcanization. Easy to apply, the emulsion is an excellent adhesive not only for wood, paper, rubber, tin plate, but also for certain plastics, for polyethylene lined paper, and siliconized paper. Other uses suggested are as sizing for paper and fabric, base for paints and special finishes, proofing, etc.

At present the material is available in limited quantities for trial fabrication, but facilities for production on an industrial scale are in course of construction.

Rubber Mission Abroad Formally Proposed

A proposal to send a rubber mission abroad, made last March by the recently elected president of The Malayan Estate Owners Association (MEOA) has now been formally presented to the government. The suggested tasks of the Mission would be: to investigate the threat of synthetic in each of the consuming countries; to look into the attitude of the governments involved toward Malayan producers and to discover whether they would enter negotiations for further



...OR DON'T THEY?

These are test samples of freshly made HORSE HEAD zinc oxides being checked for color and texture in one of the plant laboratories at New Jersey Zinc.

Do these samples meet the color and texture standards we have established for our products for the rubber industry? Almost invariably they do, since every step in the development of the properties of HORSE HEAD zinc oxides is carefully checked all along the production line. A highly efficient quality-control system sees to that.

But in the production of zinc oxides at New Jersey Zinc nothing is left to chance, especially with a century-old reputation for the most dependable pigments in the industry at stake. All the properties of all HORSE HEAD zinc oxides are double-checked before a single shipment of pigment is released to a customer. The test shown here is just one of many conducted to make sure, doubly sure, of the highest quality and uniformity standards.

Do your products contain zinc oxides which measure up to the quality and uniformity of the HORSE HEAD line?

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The New Jersey Zinc Company, 160 Front Street, New York 38, N. Y.

trade in natural rubber; to discover the attitude of rubber manufacturers to Malayan rubber; to survey new markets; and to study the possibilities of technical advisory service and aid for consumers of natural rubber. The Association would want the Soviet Union and Communist China to be included in the tour and the government to sponsor the mission to increase its prestige and scope.

It is proposed that the Mission should include: a person authorized by the Minister of Commerce & Industry; a rubber planter of very high standing; two persons representing the smallholders, one representative of Asian estates; one each for packers, the rubber trade; two persons competent to assess the technical needs of consumers and manufacturers; and an experienced secretary.

Pelletized News

The rise in rubber prices over the dollar level resulted in the reimposition of the anti-flationary cess by the Malayan Government. This apparently took place on May 7, 1959.

ITALY is to supply 5,000 tons of synthetic rubber to China, according to recent reports.

Closed for more than 3½ years because of a strike, the multi-million-dollar Feng Keong Rubber Factory in Klang, Malaya, plans to resume operations in August of this year. To begin with, only footwear will be made, and 400 workers are to be hired. Later on other lines are to be added, and more people taken on. The company was employing 1,200 persons when the strike started, reportedly as a result of the company's refusal to recognize a union claiming to represent the workers. This union, it is learned, was banned by the government last year.

THE GOODYEAR TIRE & RUBBER CO., international division, plans to build a new tire producing factory in France. The reported cost of the new facility will be $7,000,000.

Complaints in 1958 about the quality of rubber exported from Malaya referred to 2,187 tons out of the 646,148 tons exported to countries from which the complaints were received. The 1958 figure, which represents 0.34% of the total, compares with 0.24% in 1957 and 0.79% in 1956. The Malayan Rubber Export Registration Board is making every effort to improve grading; it has available for inspection three complete ranges of type samples of the grades of rubber and is trying to distribute such samples to all packers and shippers.

THE RUBBER INDUSTRY (SMALLHOLDERS, IMPROVED SUPPLY) PLANTING MATERIALS SCHEME (Malaya), has submitted a plan for expediting the supply of high-yielding material which involves the early establishment of large-scale nurseries and would cost not more than $9,000,000 (Straits).

Many sellers neglect to inform buyers of fragmented estates about the technicalities involved in securing clear title to the land they have paid for. Since there is sometimes a delay of as long as two years in transferring title, purchasers find they cannot get financial aid under the (Malayan) Government Replanting Scheme, which requires that an applicant, to be eligible for such aid, must show clear title in his own name. The Rubber Industry Replanting Board has, therefore, issued a special warning calling attention to this situation.

NIRO ATOMIZING RESEARCH LABORATORIES, Copenhagen, Denmark, is marketing a rubber powder for use in roads which is made by a spray-drying method the firm developed. Unvulcanized rubber latex containing 10 to 15% of an unspecified filler is used to produce the powder. The filled latex produced powder completely dissolves in the continuous oil phase of the bitumen, resulting in an increase in viscosity quite out of proportion to the amount of rubber added. Ductility and adhesion are also increased, and there is less tendency for water to displace the bitumen coating of stone aggregate. The Nitro process powdered rubber is free-flowing and can be used for joint-sealing compounds, waterproofing reservoirs, and roofing materials as well as road surfacing.

Manufacture of rubber goods in Malaya advanced in the first quarter 1959, as compared with that for the same period last year. Output of reinforced hose rose from 33,800 to almost 52,000 feet; footwear was up 400,000 pairs to total 3,500,000 pairs for the 1959 quarter; and rubber compound (for tire retreading) came to 830,100 pounds, against 744,300 pounds. Figures for rubber sheeting, another local specialty, showed little change at 400,000 pounds against 398,000 pounds last year. A certain amount of these goods is exported to other Asian countries, Africa, and Australia; even to Europe, it is said.

DUNLOP reports a method of applying polyethylene as a liner for mild steel tanks. Secret of success for the new method is an intermediate layer of rubber. The rubber is reported to overcome some of the difficulties in adhering the plastic to the steel and at the same time acts as an expansion control.

The question of making land for new planting available to smallholders and companies is being studied by a committee appointed by the Malayan Government, and a report is expected soon. The government is said to favor the early alienation of about 50,000 acres of virgin jungle to smallholders on a cooperative basis, and governments of the states of Negri Sembilan and Pahang are understood to be ready to offer large areas of jungle for cultivation. Certain members of the committee are said to be urging the government to give 1,000,000 acres for rubber planting in the next five years, in view of the fact that felling, clearing the land, surveying, and preparing it for planting would take well over two years.

THE GOODYEAR TYRE & RUBBER CO. (AUSTRALIA), LTD., has acquired a substantial interest in a new synthetic rubber plant being built by Australia Synthetic Rubber Co. Ltd., at Altona, Australia, according to F. T. Magennis, president, Goodyear International Corp. The new plant, being built at a cost of more than $11 million, will have an annual capacity of 30,000 long tons of SBR, with completion slated for July, 1961. The plant is part of the Australian Commonwealth's $50-million petrochemical project being built by Vacuum Oil Co., Pty., Ltd. Of the rubber companies invited to participate in the project, Goodyear is the first to join Australia Synthetic Rubber.

Tire production in South Viet-Nam is being contemplated by the well-known French tire manufacturer, Michelin, it is learnt. Initially tires and tubes for cycles would be produced and eventually also tires for automobiles.

CEYLON produced 100,196 tons of rubber in 1958 and exported 90,420 tons. Stocks at the end of the year reached a record 44,983 tons, up almost 10,000 tons, as compared with 35,650 tons at the end of 1957; the amount at the end of 1956 had been 31,771 tons.

A new £900,000 rubber plantation is to be established in Nigeria by the Western Region Production Development Board with the aid of the Colonial Development Corp. The former already has some 7,500 acres under rubber and operates two big rubber estates at Araromi and Urhonige. Western Region is in partnership with Colonial Development and West African Joint Agency, Ltd., (in which several Malayan companies are interested) in an 8,600-acre estate at Ilushin. A £300,000 processing factory is producing three tons of crepe rubber daily.

(Continued on page 780)

Photo courtesy Ohio Rubber Company, Willoughby, Ohio, a Division of The Eagle-Picher Company.

How's this for a surefire success?

This thimble-size shield works inside an automobile engine. It clings to a pulsing valve stem, prevents excessive loss of engine oil—yet allows enough oil to properly lubricate the stem. Obviously, a tough job for a tiny part.

To do this critical job, rubber seemed the likely choice. But it would have to be a very special kind of rubber. It would have to withstand constant contact with oil, intense vibration and compression, wide temperature extremes and great tension.

Material selected: CHEMIGUM, the synthetic rubber that maintains its dimensional stability under blistering-hot oil attack and the most demanding conditions. Hundreds of thousands of these valve stem shields are now in use—meeting every operational requirement. And the constant uniformity plus the easy processability of CHEMIGUM make their production practical and profitable.

What can CHEMIGUM do for your product? For full details and technical assistance on CHEMIGUM—and a complete line of rubber chemicals and synthetic rubbers—write Goodyear, Chemical Division, Dept. H-9418, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Chemigum—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

Photo courtesy The Brunswick-Balke-Collender Company, Chicago, Ill.

How to prepare for a lifetime of "hard knocks"

This bowling ball—being test-bounced against a concrete-embedded steel plate—is headed for a lifetime of "hard knocks." It will be hurled down hundreds of maple lanes–crash into thousands of tenpins. Yet, it must retain its perfect shape, balance and weight.

To measure up to those exacting requirements, the nation's foremost manufacturer of bowling balls used to rely entirely on natural rubber. Now, a synthetic rubber is used that actually improves the quality of the compound. And that's PLIOFLEX by Goodyear. Mixed with natural rubber and other basic ingredients, PLIOFLEX has enabled the firm to give a *lifetime guarantee* with every ball it makes.

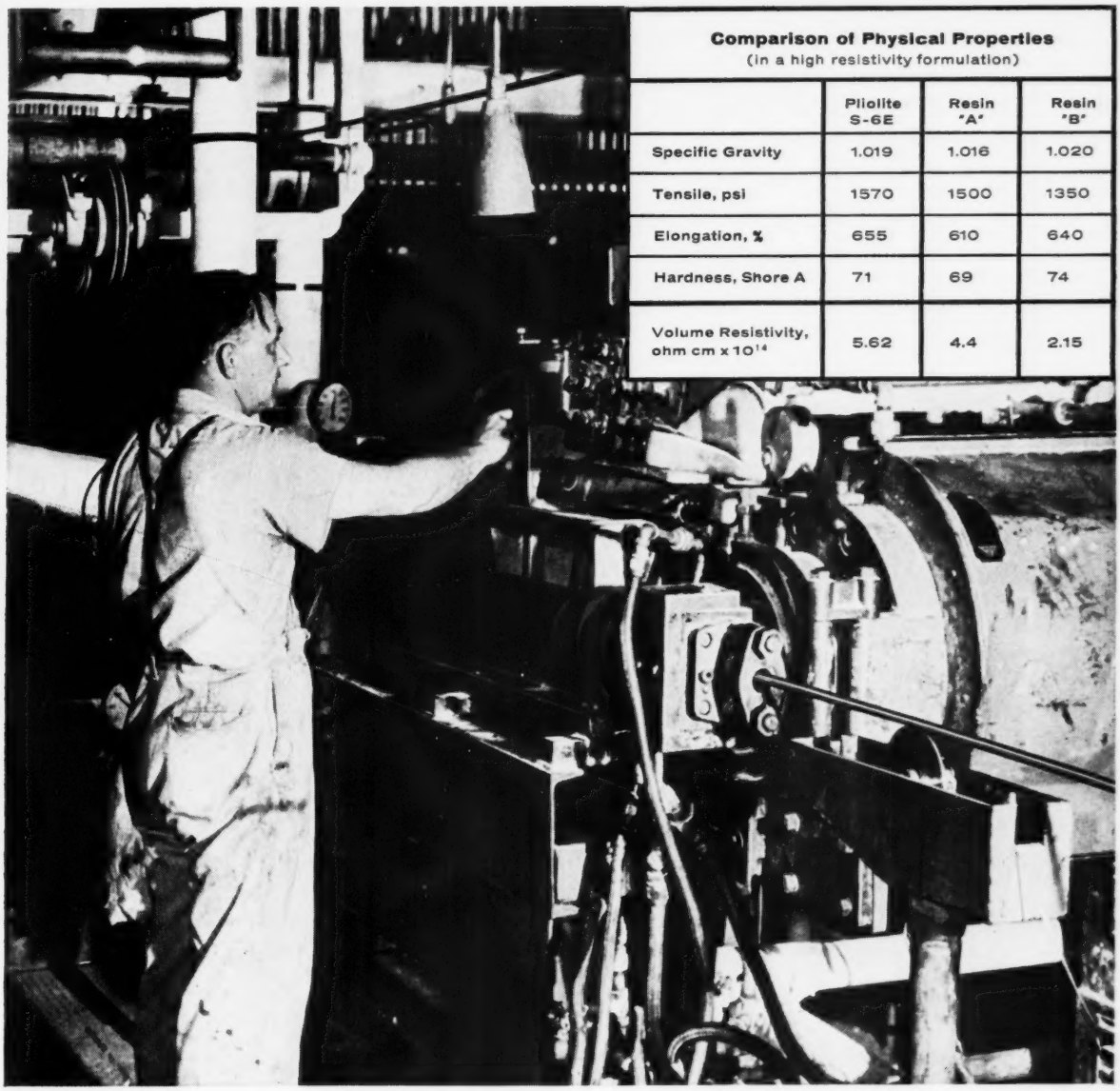
It has also made possible greater processing efficiency with resultant savings in time and money. The exceptional uniformity of PLIOFLEX is a key reason for this–along with its excellent dispersion characteristics and good color stability. These qualities help make the finished product a unique combination of precision craftsmanship and incredible toughness.

If you're looking for a material that can bowl over production problems–and improve product–PLIOFLEX may be right down your alley too. For full information, plus latest *Tech Book Bulletins* on other synthetic rubbers and rubber chemicals, write Goodyear, Chemical Division, Dept. H-9418, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Pliofiex–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



Comparison of Physical Properties
(in a high resistivity formulation)

	Pliolite S-6E	Resin "A"	Resin "B"
Specific Gravity	1.019	1.016	1.020
Tensile, psi	1570	1500	1350
Elongation, %	655	610	640
Hardness, Shore A	71	69	74
Volume Resistivity, ohm cm x 10^{14}	5.62	4.4	2.15

Photo courtesy, The Okonite Company, Passaic, New Jersey

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It's here! PLIOLITE S-6E—the new electrical grade, rubber reinforcing resin that will enable you to meet tight wire covering specifications with ease. In trial plant runs, for instance, PLIOLITE S-6E has been particularly successful in meeting the requirements for covering on RHW and RW Wire.

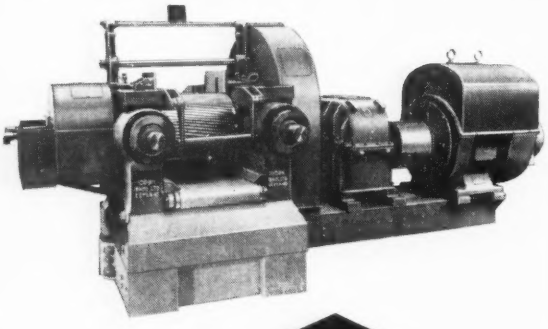
PLIOLITE S-6E is a new high styrene/butadiene copolymer which not only exhibits superior electrical properties (see data above), but also processes and reinforces on a par with any resin on today's market. And best of all, it's offered at the same price as ordinary reinforcing resins.

We think you'll be pleasantly surprised at just how well PLIOLITE S-6E performs. But the best way to find out is to put it through its paces yourself. Samples and full details, including the latest *Tech Book Bulletins*, are yours by writing Goodyear, Chemical Division, Dept. H-9418, Akron 16, Ohio.

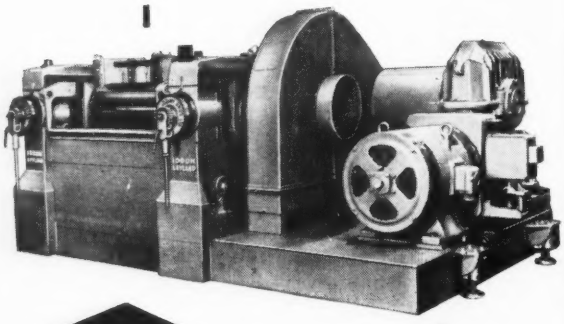
GOODYEAR
CHEMICAL DIVISION

Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

PROGRESSIVE PRODUCTION



C.A.6.
Heavy Duty Single Geared Cracker with Take-Off Conveyor. Machine mounted on fabricated sub-frame fitted with vibro-insulators. Rolls 20" dia.



B.Y.II.
Heavy Duty single Geared Mixing Mill with backshaft drive. Mounted on fabricated steel bed-plate fitted with vibro-insulators. Rolls 22" dia.

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Cross-section of coil insulated with G-E's Polyseal system

Improved G-E A.C. Motors

New features of the random- and form-wound motors offered by General Electric Co.'s medium a.c. and generator department, Schenectady, N. Y., are said to extend the range of applications for open motors and provide custom-made motors to meet specific requirements of chemical, rubber, and other industries.

The building-block design of the form-wound motors, which range from 900 to 5,000 horsepower, improved bearing seals, and coil wedging are features which make it possible to fulfill the specific needs of a variety of industries. Open, weather-protected, and totally enclosed motors have the same general appearance, but the upper enclosure is varied to meet the user's requirements.

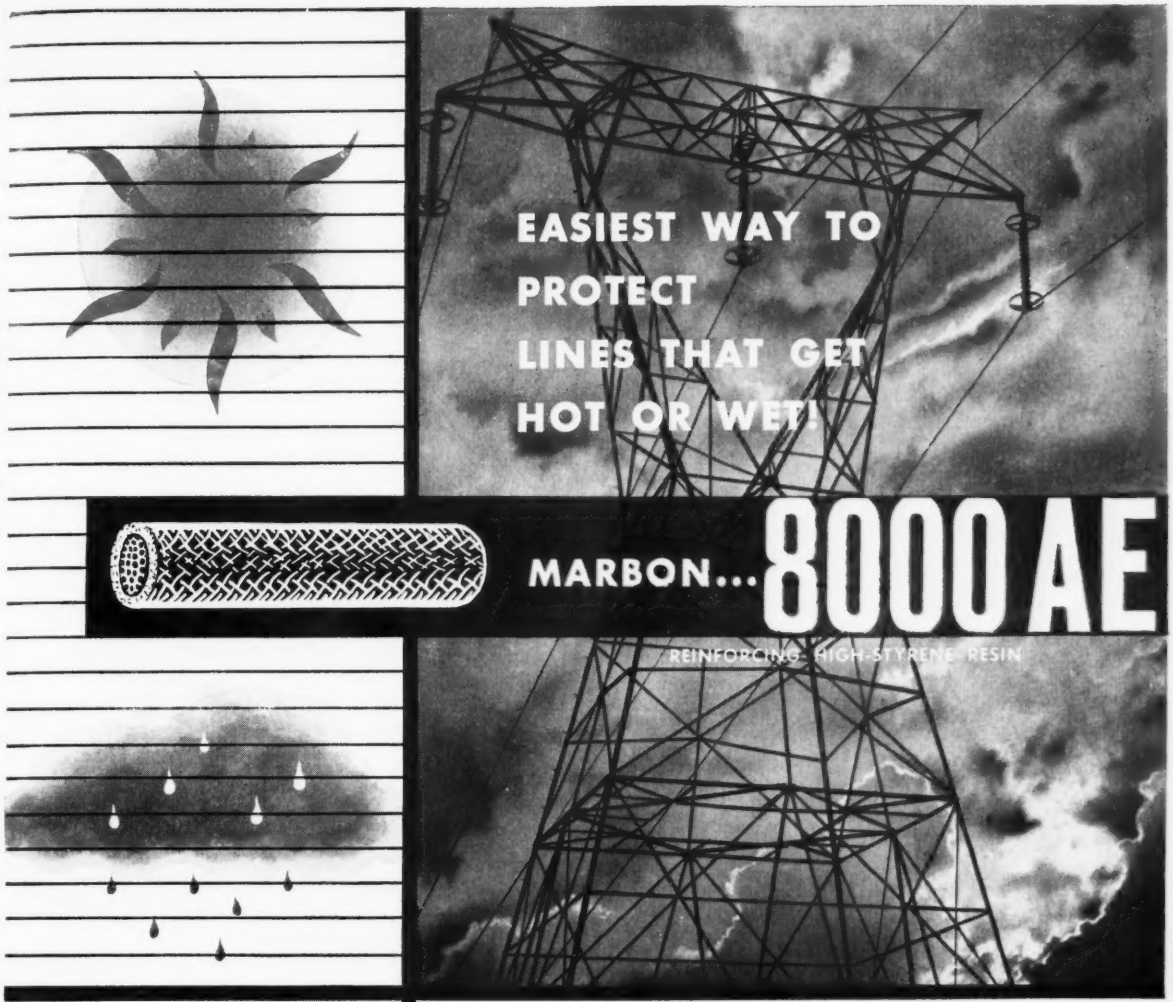
In addition to the standard features, a typical motor for a rubber industry application is equipped with Polyseal insulation, carbon-black resistant bearing seals, split end shields, air deflectors on larger motors, and a special high-torque design for Banburys and mills. A new feature of this line is a Polyseal supported silicone rubber insulating system that now adds superior mechanical strength and greater resistance to adverse environments to the outstanding voltage and thermal characteristics of conventional silicone rubber insulation.

In the new line of G-E a.c. motors, form-wound coils are given a consistent build-up of supported silicone rubber tapes. The entire coil is vulcanized to bond the tapes and provide a single, uniform dielectric wall around the coil. The bonding of individual layers of tape prevents the entrance of contaminants.

The mechanical advantage of Polyseal insulation is that each layer contains Dacron and glass supporting fabrics which add greater strength to the coil, thus helping prevent cut-through and fracture of the silicone rubber. Also, the supporting fabrics help prevent silicone rubber migration.

To prevent contaminants from entering the coil through the critical point where the lead emerges from the coil, a special silicone rubber compound is placed beneath the lead. When the coil is vulcanized, this compound seals the lead tubing to the silicone rubber coil coating.

Other features of the new G-E series of a.c. motors have been reported. Motor size has been significantly reduced; the average reduction is on the order of 25%. For the first time on G-E motors rated above 125 horsepower, prewound cores



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New Equipment

are used. This construction has enabled the company to improve the varnish impregnation, or silicone rubber encapsulation, of the insulation system. The moistureproof random-wound motors, ranging from one to 125 horsepower, may be sealed with the silicone compound.

Also a new bearing system utilizing heavy-duty, anti-friction bearings has been incorporated in the redesign. It has a regreasable sealed bearing housing and a large grease reservoir that allows for longer periods between regreasings. The aluminum rotor is centrifugally cast and dynamically balanced to reduce maintenance problems. Other features in the random-wound line include labyrinth seal on the shaft to seal out water; cast-iron gasketed conduit boxes; and a waterproof seal where power leads enter the motor frame. In addition, all external hardware is plated with zinc chromate for increased resistance to corrosion.

Series "300" Atlas hydraulic press

Series "300" Hydraulic Presses

The new Series "300" Atlas hydraulic presses, announced by Atlas Hydraulics Division, Delaware Valley Mfg. Co., Inc., Philadelphia, Pa., have been designed so that they may be adapted to the many basic and unusual requirements of compression or transfer rubber molds. Many features have been incorporated into a compact self-contained unit said to be completely flexible and readily adaptable to new methods or procedures. Both platen closing speed and hydraulic pressure are adjustable and may be preset. These presses are recommended for laboratory or production work because they are ruggedly constructed to produce consistent results.

Standard construction includes fully encircled bronze column guides for parallel movement of platens and perfect alinement of molds; sturdy chrome-plated columns for maximum rigidity and minimum wear; a chrome-plated ram for extended packing life; and a complete heavy-duty pumping unit.

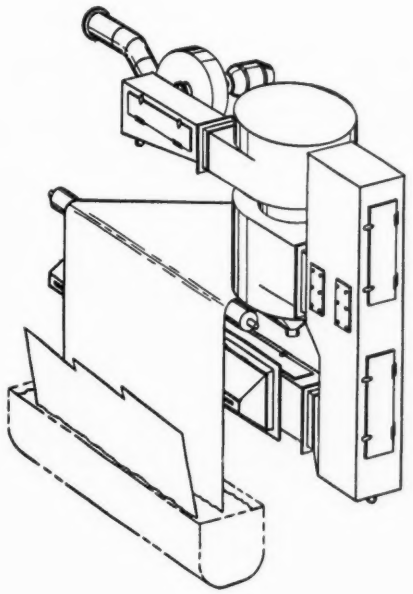
The presses are built in 13 standard models with platen sizes ranging from 14 by 14 inches to 24 by 24 inches and capacities from 25 to 300 tons. They can be built in special sizes or capacities to suit individual requirements.

Platens may be electrically or steam heated, with provisions for water cooling, if desired. Automatic indicating or recording-type temperature controllers can be supplied for accurate control and adjustment to temperature.

The presses can be built for either manual push-button or automatic cycle timing operation. Daylight opening, ram stroke, and number of platens are built to individual requirements. Special characteristics are available for custom applications.

TIRE FABRIC PROCESSING EQUIPMENT

VACUUM RECOVERY SYSTEMS



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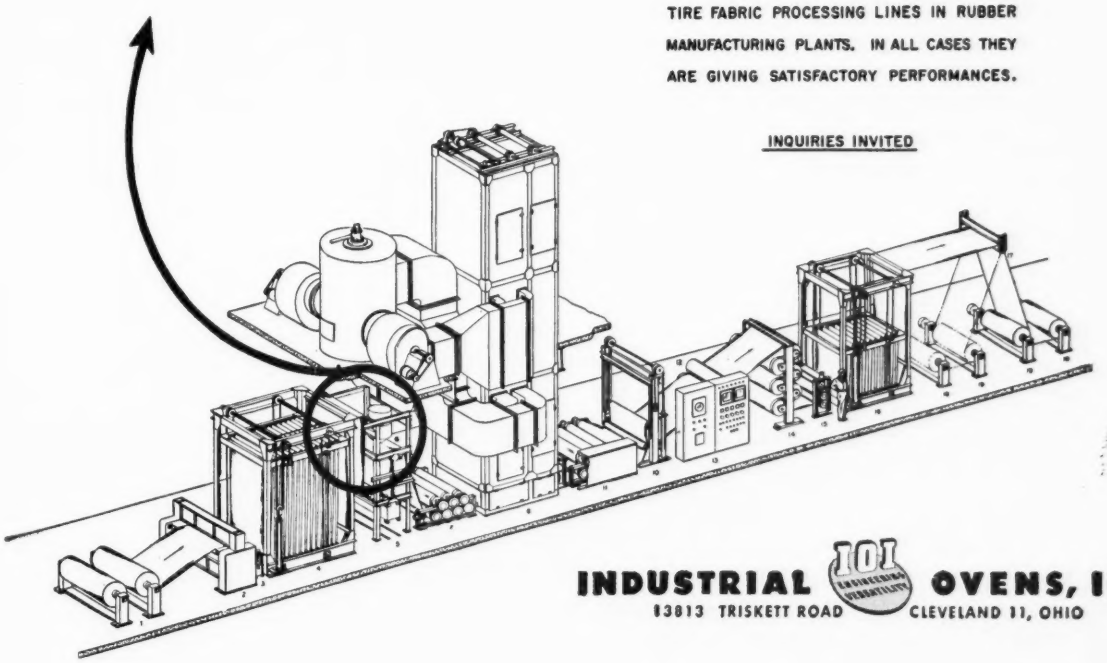

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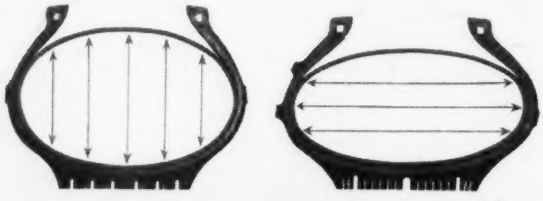
NEW PRODUCTS



Wider cross-section of new low profile tire *(right)* than that of conventional tire is said to give added stability and safety at turnpike speeds

Low Profile Tire Line Extended

United States Rubber Co., New York, N. Y., has announced three new tires extending its low profile principle of tire construction which first appeared in the low profile U.S. Royal Master premium tire.[1] A low profile tire selling at about 10% above the current price for standard tires is called the U.S. Royal Super Safety 8. A popular priced tire, called the U.S. Royal Safeway, and a new mud-and-snow tire, the U.S. Royal Winteride, are the other two tires.

The Super Safety 8, produced only in nylon cord, has a wider and deeper tread pattern which is said to give 30% longer wear than present standard lines. More inserts, like fine cuts, are included in the tread for better traction and skid resistance.

The Safeway, produced in both rayon and nylon cord construction, is said to give 25 to 35% better mileage than current popular priced tires on the market. Its low profile construction gives it good high-speed performance. Its skid and traction performance is raised by about 10% above current tires in its price range, according to U. S. Rubber.

The Winteride incorporates the low profile advantages in a mud-and-snow tire. It is said to have a deep biting tread for snow-and-mud traction and to ride silently on bare pavement.

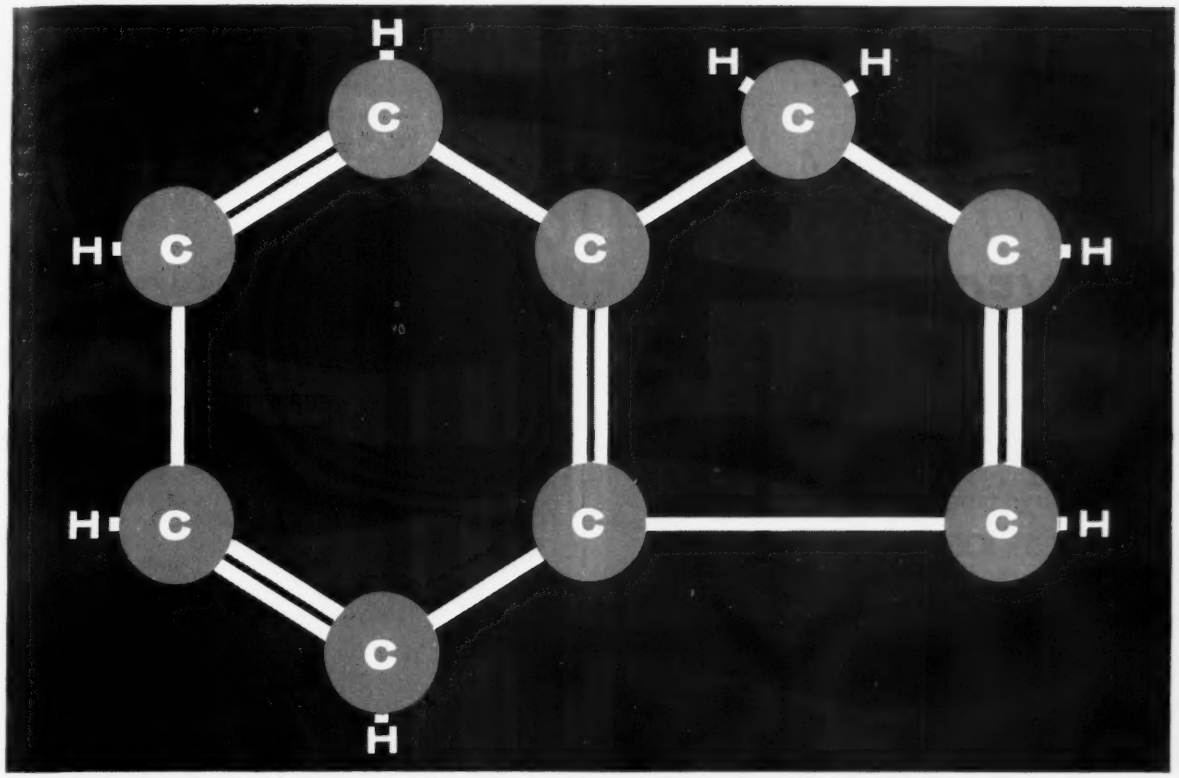
The rubber company reports that the new low profile tires release 13% more usable engine horsepower than conventional tires. This saving can result in as much as 12 extra miles per tankful of gasoline.

[1]See RUBBER WORLD, Oct., 1958, p. 99.

Power Express Steel Cable Tire

B. F. Goodrich Tire Co., Akron, O., has started production of a steel cable truck tire which is said to give up to 20% more mileage than conventional truck tires. In the new tire, called the Power Express Steel Cable, 39 high-tensile steel filaments, 0.0058-inch in diameter, are twisted to form each of the hundreds of cords in the tire carcass. Each cord has a minimum tensile of 355 pounds, giving the tire unusually great strength and stability, reports the company.

The two-ply Steel Cable tire is said to reduce the incidents of flats, practically eliminate bruise breaks in the carcass and because the steel cords do not stretch, eliminate tread flexing to give added mileage and enable repeated retreading. Having thinner sidewalls, the tire runs cooler and has greater safety and longer life, according to BFG. The tire is especially recom-



Neville Announces Production of HIGH PURITY INDENE

Neville is now in semi-commercial production of high-purity indene. It is a mobile, almost water-white, high boiling liquid, similar in appearance to monomeric styrene. The big potential interest in this new chemical lies in the fact that it has two reactive centers—the double bond and the methylene group—both in the five-membered ring fused to the benzene nucleus. Indene will polymerize or react to form a wide range of useful intermediates. Potential uses are indicated in the fields of polyesters, synthetic rubbers, copolymers, insecticides and repellants, drugs, dyes, plasticizers, antioxidants, surface active agents and synthesis of steroids and vitamins. Use your letterhead or the coupon below to write for a bulletin and sample.

Typical Inspection

Purity, % by Wt.	97.5
Freezing Point, °C.	−3.5
Specific Gravity 60/60°F.	1.0002
Refractive Index (n^{25}/D)	1.5726
Distillation Range (IBP-EP), °C.	180.0-186.0
Flash Point, °F.	173
Color (Saybolt)	+21 (inhibited)

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New Products

mended for front-wheel applications on high-speed trucks, though it can be used on front and rear wheels.

Current production of the tire is limited to heavy-duty, tube-type truck tires in sizes 9.00-20, 10.00-20, and 10.00-22. Sizes 8.25-20, 11.00-20, and 11.00-22 will go into production soon.

Grand Prix Racing Tire

Goodyear "Grand Prix" racing tire

The Goodyear Tire & Rubber Co., Akron, O., has developed a new sports-car competition tire designated the "Grand Prix." During its development, it was tested at a 12-hour endurance race at Sebring, Fla., and at the first National SCCA meet at Pensacola, Fla. At Sebring it was the first U. S.-made tire to cross the finish line; at Pensacola it was on the car, a Ferrari, which placed first.

The tire has been constructed for sprint speeds of 160 mph. and sustained speeds of 140 mph. Designed to improve high-speed centrifugal throwout and eliminate distortion wave, it is said to give the driver faster cornering and better response to his wheel because of more tread area on the ground.

Constructed with triple-tempered 3-T process nylon cord, the tire is said to run cooler and have better chipping, tearing, and separation qualities.

Grand Prix tires are available in 5.50/5.90-15, 6.50/6.70-15, 5.50-16, 6.00-16, 6.50/6.70-16, and 7.00-16 sizes. The 6.50/6.70-16 and 7.00-16 Grand Prix are designed with six-ply construction, with all others of a four-ply construction.

"Briskeat" SRE Blankets

Large silicone-rubber heating blankets for industrial uses are now being fabricated in flat or contoured form to customer requirements and specifications by the Briscoe Mfg. Co., Columbus, O. Designated "Briskeat" SRE blankets, each one represents a complete integral electrical heating system. Such parameters as size, weight, operating temperature, etc., are variable with considerable latitude.

The following values are imposed on some of the more common ones: size, unlimited; weight, one pound per square foot approximately; thickness, 7/64-inch approximately; Watt density, 10 watts per square inch maximum; operating temperature (continuous), 500° F., (intermittent), 550° F.; power requirement, any voltage or phase within watt density range.

Special reinforcements, hardware, and thermal sensing devices may be integrally molded on to the blankets as required. The blankets are said to possess excellent durability, ruggedness, flexibility, and thermal efficiency. The blankets are suggested for use in the curing of large reinforced plastic structures and the bonding of sandwich constructions. They are specially suited for field repair work.

Other applications include temperature stabilization of large equipment or enclosures and heat conditioning of large sheet-metal parts prior to forming. In general, these blankets find use where a flexible electric heating system is required.

A technical bulletin, No. 59-4, entitled "Silicone Rubber Heating Blankets," is available from the company.

FIRST and LEADER...

In industry, too, to be "First" indicates leadership. Copolymer's many notable "Firsts" have identified them as the leader in the field of synthetic rubber. Among these accomplishments are:

First to produce cold rubber,
First to develop cold latex
for foam sponge, and,
First to produce commercially
a dispersant-free black
master batch.

Copolymer's proven leadership and improved research facilities assure its customers that they will stay ahead of the field in synthetic rubber developments.

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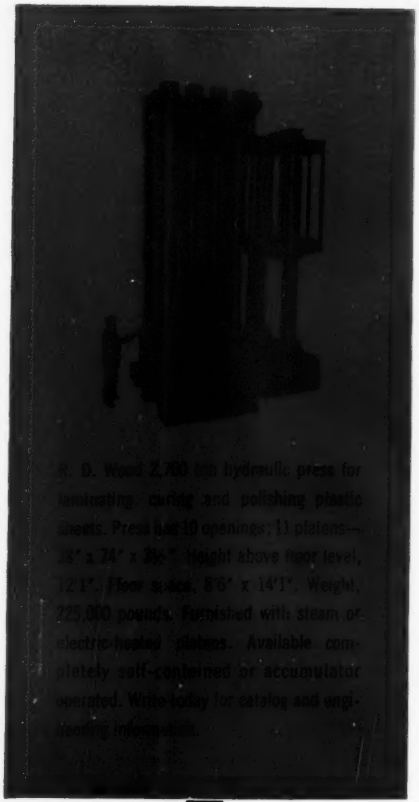
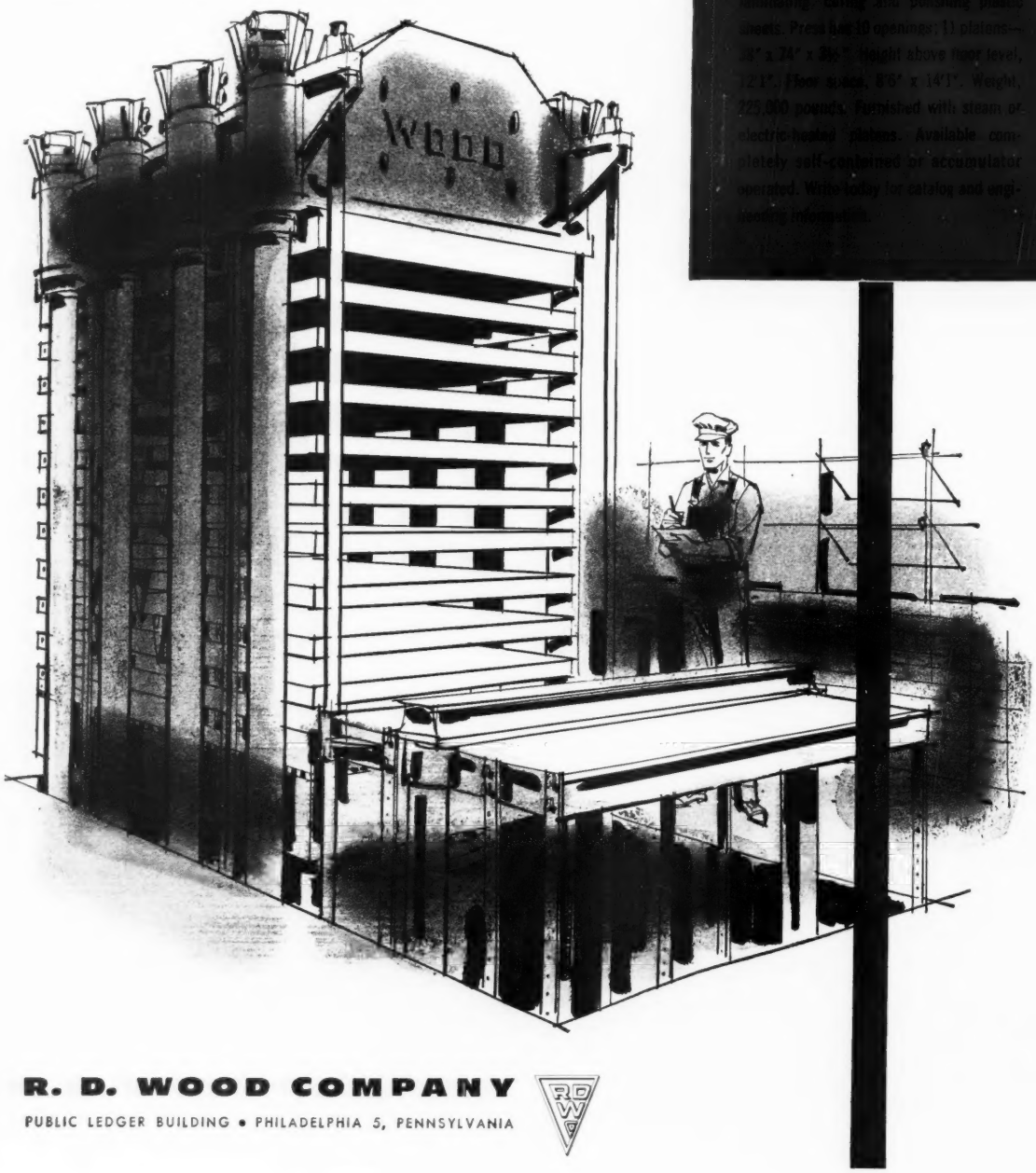
Plastic sheets with superior surface finish, uniform thickness and exceptional strength characteristics result every time you laminate, cure or polish with a Wood Press. So regularly, in fact, that you take superior performance for granted. But here's a Wood that gives you an added bonus—savings in time! While the press is closed, curing ten-sheet packages, ten additional packages can be prepared for processing and inserted in alternate openings of the 20-opening elevator. Dual operation speeds loading and unloading . . . keeps press in constant operation. No down time. No lost motion. A natural for every plastics manufacturer.



R. D. Wood 2,700 ton hydraulic press for laminating, curing and polishing plastic sheets. Press has 10 openings; 11 platens—32" x 74" x 3½" thick; height above floor level, 12'1". Floor space, 8'8" x 14'1". Weight, 225,000 pounds. Furnished with steam or electric-heated platens. Available completely self-contained or accumulator operated. Write today for catalog and engineering information.



R. D. WOOD COMPANY

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Aerial view of National Kaolin Products Co. Processing Plant, Aiken, S.C.

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NEW MATERIALS

New G-E SE-101OU Silicone Rubber

A new silicone rubber compound designed for use in the fabrication of semi-cured electrical tapes is available from General Electric Co.'s silicone products department, Waterford, N. Y. Designated SE-101OU as the uncatalyzed form, the rubber makes possible a reinforced type of silicone insulated system which extends the service life and reliability of electrical equipment over a wide range of environmental conditions. This new material is recommended for sealed insulation systems for motors.

Reinforced silicone rubber insulation made with SE-101OU combines superior mechanical properties with the electrical properties of unsupported silicone rubber insulation. Semi-crude electrical tapes with SE-101OU are said to possess high interply bond strength, improved shelf life, good voltage aging characteristics, and excellent corona resistance. The processed tape is easy to apply to electrical equipment, according to the company.

Some typical physical properties of SE-101OU, as determined on a 70 mil ASTM slab, are reported as follows:

	Oven Cure	
	1 Hr./150° C.	24 Hrs./250° C.
Hardness, Shore A	50	60
Tensile, psi	1,200	900
Elongation, %	560	340
Tear, psi. (die B)	105	75

Other advantages of reinforced silicone rubber insulation with SE-101OU are reported to be improved resistance of abrasives, shock, vibration, and cut through; superior interply peel strength; resistance to flow under pressure; and ease of application.

Additional information on SE-101OU and reprints of a paper, "A New Supported Silicone Rubber Insulation System," can be obtained from G-E.

New Plioflex 1508X SBR

Plioflex 1508X, a new, exceptionally light-colored, cold SBR rubber, is now available from the chemical division, The Goodyear Tire & Rubber Co., Akron, O. Stabilized with a non-staining, non-discoloring antioxidant, it is said to combine excellent color with outstanding physical properties and to maintain these desirable characteristics after aging.

Through proper compounding, a wide variety of bright colorful finished products are possible. Areas of application for Plioflex 1508X include shoe soles, white sidewalls, flooring, sporting and household goods, and related products demanding the highest color standards.

Some typical properties of Plioflex 1508X raw polymer are reported as follows:

Polymerization temperature, ° F	41
Stabilizer	non-staining, non-discoloring
Emulsifier	all fatty acid
Bound styrene, %	23.5
Coagulation	salt acid
Mooney viscosity, ML 4′ @ 212° F.	50

A Tech-Book Facts bulletin, PF-28, which gives discoloration and staining test results and an evaluation of a Plioflex 1508-HAF black formulation, is available from the company.

NEW EASY PROCESSING RUBBER

Ameripol 4600 permits short breakdown time; fast cure

Ameripol 4600 is a new non-staining cold SBR polymer designed for easy processing into shoe soles, floor tile and other light colored or white products.

It has a Mooney viscosity in the 36 to 48 range. Thus the polymer can be broken down in drastically reduced time compared to high Mooney polymers generally used. Ameripol 4600 has good physical and aging properties. Being a fatty acid type polymer, it cures quickly.

This polymer is now available in production quantities. Why not give it a test? We'll gladly send complete data and samples for your evaluation . . . use the coupon for your convenience. Goodrich-Gulf Chemicals, Inc., 3121 Euclid Avenue, Cleveland 15, Ohio.

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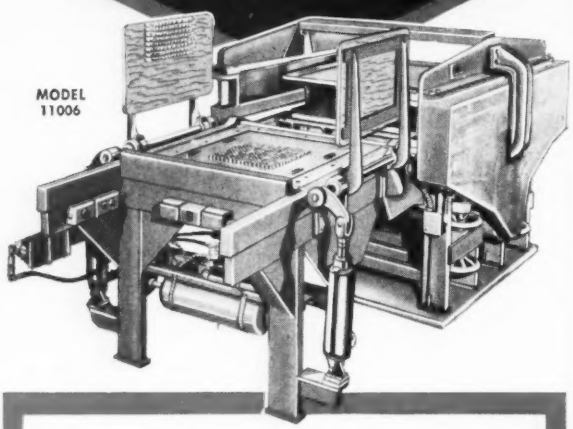
IN 10 SECONDS IT TRIMS ENTIRE SHEET OF MOLDED GOODS right from the mold!



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A Trimming machine so efficient it pays for itself in six months' time! That's what some customers tell us about the New FEMCO Standard Automatic Trimmer shown above. It gives you single impression cutting, same high speed production, same sheet trim dimensions as our "Roll Lift" Model at a big savings in price!

Our Vertical Die Handler, standard equipment on this model, lets you trim tall Molded Rubber parts and two level flash lines simultaneously! Trims a full sheet in less than 10 seconds!

Besides Molded Rubber parts, you can trim natural and synthetic foams, open and closed cell sponge rubber, cork, vacuum formed parts, etc. Let us tell you more—refer to Model 11006 when you write or call.

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Buy this and other FEMCO Equipment on our Financing plan.

New Materials

Flexol EP-8, EPO Plasticizers

Two new epoxy plasticizers for vinyl resins, Flexol EP-8 and Flexol EPO, may be had in experimental quantities from Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. Commercial quantities will be available this summer from facilities now under construction at Institute, W. Va.

Flexol EP-8 is 2-ethylhexyl epoxy tallate, and Flexol EPO is in epoxidized soybean oil. Both are characterized by high oxirane oxygen and low unsaturation said to give excellent long-term compatibility, stabilizing action, and resistance to color development and rancidity in vinyl formulations. Both are effective, low-cost heat and light stabilizers, as well as plasticizers, for vinyl chloride polymers.

Flexol EP-8 can be used as a low-temperature plasticizer in place of azelate, adipate, and sebecate plasticizers. The viscosity and solvating power of Flexol EP-8 are low, giving low viscosity and excellent viscosity stability to vinyl plastisols. Vinyl films and sheeting containing Flexol EP-8 are said to have good hand and drape.

Flexol EPO has excellent resistance to extraction by oil and water when used to plasticize vinyl chloride polymers. Maximum compatibility and stabilization are assured, according to Union Carbide.

Both plasticizers are expected to find broad uses in vinyls, such as: electrical insulations, calendered film and sheeting, coated fabrics, garden hose, flooring, gaskets, foam, and molded articles. EP-8 and EPO are effective acid-acceptor stabilizers for chlorinated solvents and rubber, and plasticizers for nitrocellulose coatings and synthetic rubbers.

Some typical physical properties of Flexol EP-8 and Flexol EPO are reported as follows:

	Flexol EP-8	Flexol EPO
Molecular weight (approximate)	416	....
Specific gravity, 20/20° C.	0.9221	0.9969
Average weight per gal. at 20° C., lbs.	7.70	8.30
Boiling point, 5 mm. Hg (decomposes)	>215° C.	....
10 mm. Hg (decomposes)	....	>150° C.
Vapor pressure at 200° C. (decomposes)	0.3	....
Freezing point	−14.5° C.	....
Solubility, in water @ 20° C., % by wt.	<0.01	<0.01
Water in, @ 20° C., % by wt.	0.3	0.3
Absolute viscosity, centipoises @ 0° C.	97.1	....
20° C.	33.5	633
40° C.	15.1	....
Flash point (open cup)	450° F.	580° F.
Refractive index @ 20° C., n_D	1.4513	1.4727

Additional information on these plasticizers can be obtained from the manufacturer.

Naugapol KO-50 SBR Masterbatch

Naugapol KO-50, a new high styrene resin, oil-extended SBR masterbatch, has been announced by Naugatuck Chemical Division of United States Rubber Co., Naugatuck, Conn. A cream-colored pellet-form material, it is made by coprecipitating blended latices and contains 50% high styrene resin by weight. It has a specific gravity of 0.98.

The rubber portion of the new material is based on straight fatty acid soap emulsification and is polymerized at low temperature. The oil used is a very light colored naphthenic-type oil.

Naugapol KO-50 is designed for use with additional SBR copolymers, including oil-extended rubbers, in the manufacture of shoe soles, floor tile, and wire insulation. This masterbatch may be blended with other synthetics and natural rubber to produce a wide variety of products. A special finishing gives

(Continued on page 674)

extrusions

Here are a few of the thousands of extrusions made by Pawling Rubber Corporation.

Pawling Rubber reports:

"Faster, cleaner, smoother extrusions with AMERIPOL MICRO-BLACK masterbatch"

Pawling Rubber Corporation, Pawling, New York, turns out thousands upon thousands of stock and custom precision extrusions—in rubber, plastic and silicone—for the appliance, aviation, automotive, electronics and construction industries.

For a large portion of their synthetic rubber extrusions, Pawling uses Ameripol Micro-Black—the new, high-dispersion SBR masterbatch produced by an exclusive high liquid shear agitation process.

Since the carbon black is already integral in Micro-Black—and more thoroughly dispersed than in any conventional dry mix—Pawling gets these advantages by using Ameripol Micro-Black.

Extrusions are much faster and smoother, because of the superior dispersion of carbon black in Micro-Black.

Finished products have superior physical properties—greater tensile strength, greater stress resistance.

Pawling saves space by eliminating the storage of loose black, as well as the problems of weighing and mixing it.

Micro-Black gives them a cleaner, more efficient operation. No messy black to handle or clean up.

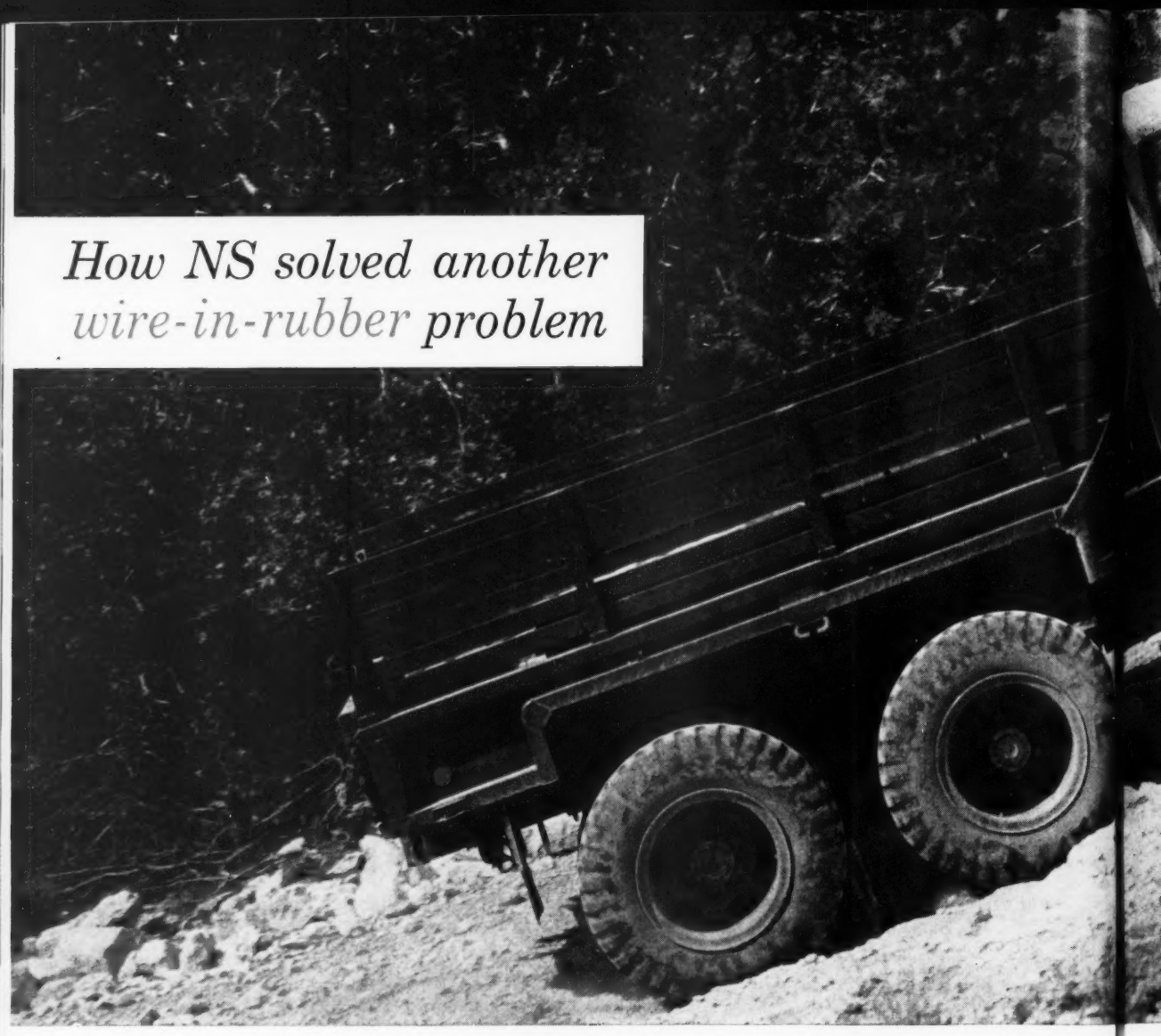
They save the time of 4 sweep-down cycles for black incorporation. This time-consuming operation is not required at all with Ameripol Micro-Black.

See how you can speed up production, improve your product and cut costs with new Ameripol Micro-Black. For complete information on the properties and applications of all 11 types of this high-dispersion masterbatch, write for new illustrated Micro-Black data book.

B. U. Adamson, Goodrich-Gulf Sales Engineer (left) watches M. A. Bedics, Chief Engineer of Pawling Rubber Corporation, make hardness test on a stock that includes Micro-Black masterbatch.

Goodrich-Gulf Chemicals, Inc.

3121 Euclid Avenue, Cleveland 15, Ohio



How NS solved another wire-in-rubber problem

NATIONAL-STANDARD DEVELOPS SPECIAL BEAD WIRE FOR BUTYL TIRES

When several major tire manufacturers began experimenting with butyl rubber for passenger and military vehicle tires, a major problem was encountered—to develop a bead wire finish and butyl stock that provided the necessary adhesion.

NATIONAL-STANDARD engineers were called in by the tire manufacturers to develop a bead wire that would have the needed adhesive properties. Without such a bead wire, it would not be possible to utilize butyl in tires. Months of intensive experimentation and testing were spent by National-Standard engineers on a wide variety of metallic wire finishes, as well as fabricated braid and Pierce tape. These fabricated bead wires have proved particularly successful.

While their engineers in the laboratory at Niles, Michigan, were working on wire finishes and bead formations, National-Standard called in an independent research laboratory to find a butyl compound recipe that would give adhesion to bead wire finishes, and —at the same time—be compatible with the butyl stock used in the tire carcass.

RESULT—From these two concurrent research projects came the development of a bead wire and several butyl compounds which will provide satisfactory adhesion to meet tire manufacturers' special needs. Tire manufacturers have begun field testing of new butyl tires with National-Standard bead wire.

DEVELOPMENT ENGINEERING in new uses for wire in rubber products has made National-Standard the leader in this field for over 50 years. Wherever you have a wire-in-rubber problem, let National-Standard put their experience to work for you. For additional information write National-Standard Company, Niles, Michigan.

TIRE TESTS being conducted at proving ground on butyl tires for military vehicles show that butyl tires with new National-Standard bead wire hold up under rugged road conditions.

BRAIDED BEAD WIRE was subjected to stringent tests in National-Standard's laboratory to determine its adhesive properties with butyl.

Manufacturer of Specialty Wire for Rubber Products

NATIONAL STANDARD

DIVISIONS: NATIONAL-STANDARD, Niles, Mich.; tire wire, stainless, music spring and plated wires • **WORCESTER WIRE WORKS** Worcester, Mass.; high and low carbon specialty wires • **WAGNER LITHO MACHINERY,** Secaucus, N. J.; metal decorating equipment • **ATHENIA STEEL,** Clifton, N. J.; flat, high-carbon spring steels • **REYNOLDS WIRE,** Dixon, Ill.; industrial wire cloth • **CROSS PERFORATED METALS,** Carbondale, Pa.; decorative, commercial, and industrial perforated metals.

it's what
it doesn't have
that makes it good!

National® ANILINE

What doesn't our aniline have that makes it so good?

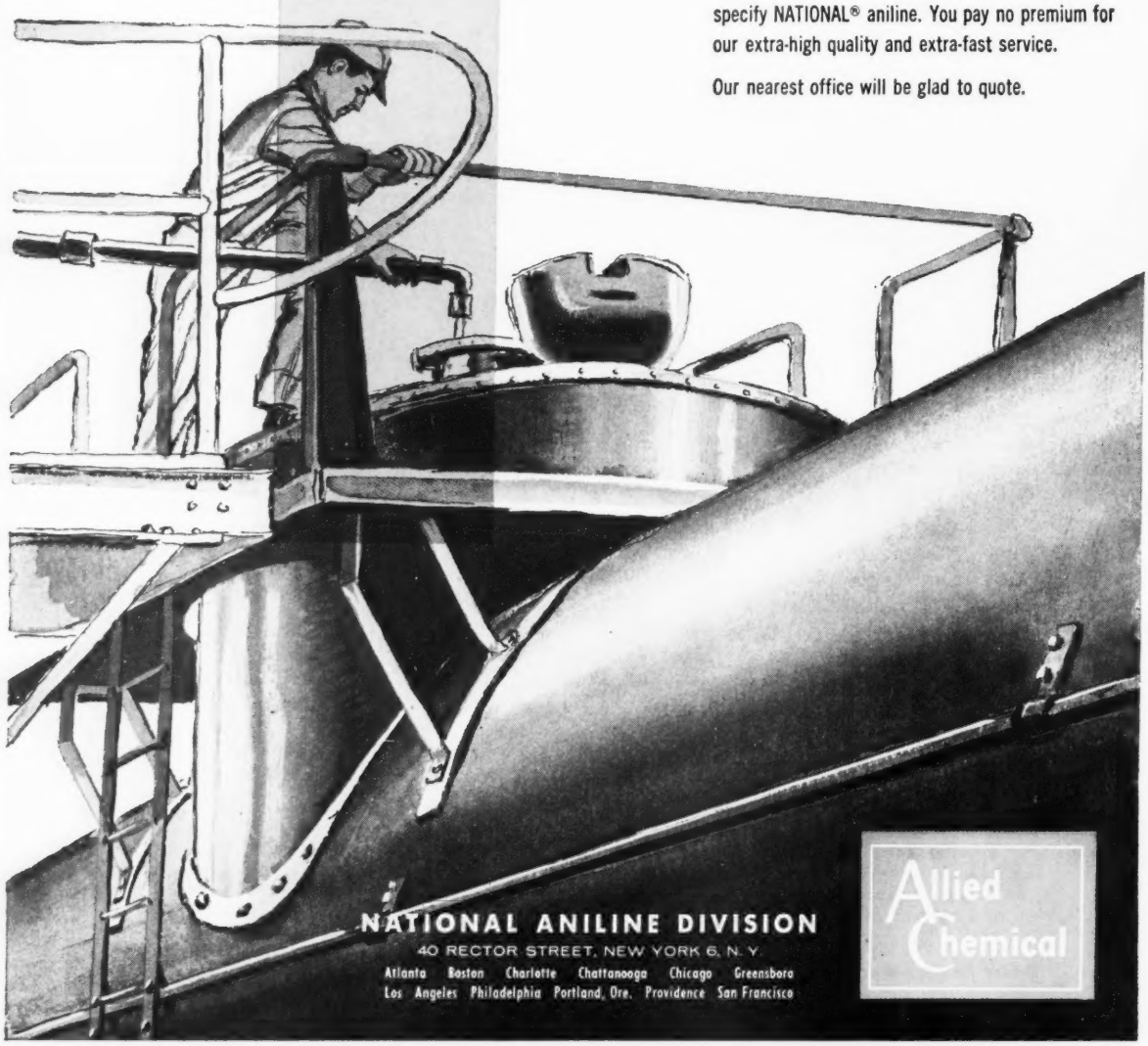
It has very little moisture (4/100 of 1% maximum).

It has very little color (Barrett Standard 1.0).

It has very low total impurities. (Our shipping spec is 99.9% but we regularly load cars analyzing 99.95+% That's better than ACS CP aniline specs).

So if you want clear, colorless, nearly dry, high-purity aniline shipped by tank car or tank wagon from Moundsville, West Virginia, on 24-hour notice, specify NATIONAL® aniline. You pay no premium for our extra-high quality and extra-fast service.

Our nearest office will be glad to quote.



NATIONAL ANILINE DIVISION
40 RECTOR STREET, NEW YORK 6, N. Y.
Atlanta Boston Charlotte Chattanooga Chicago Greensboro
Los Angeles Philadelphia Portland, Ore. Providence San Francisco

Allied Chemical

Another new development using

B.F.Goodrich Chemical *raw materials*

Oil Resistant Ripple' Soles for Colt work shoes are molded of Hycar by Beebe Rubber Company, Nashua, N.H. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

Now Ripple' Soles go to work

HYCAR MAKES THE SHOES FIT THE JOB

The relaxing comfort and shock absorbing action of these unique shoe soles now fit the feet of workers in industrial plants, machine shops and gasoline stations. The soles are being made with Hycar nitrile rubber to provide resistance to the oils, alkalies and acids commonly found in such locations.

Standing up to oils, greases and solvents that would quickly do ordinary rubber to death is just one of the advantages of Hycar. It also withstands repeated and severe deformation, and retains outstanding resilience under a wide range of temperature variations.

In addition, Hycar earned this statement from the maker of the soles: "It is the best to work with of any of the nitrile rubbers tested."

Hycar is often the material that can step up sales—it improves present applications or opens the way to new markets. Get more information by writing Dept. CA-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar

Rubber and Latex

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

News about

B.F.Goodrich Chemical *raw materials*

FOR UNUSUALLY HIGH ABRASION RESISTANCE... USE HYCAR 1072

This carboxyl-modified nitrile rubber gives a compound far more abrasion resistance than any other rubber. During laboratory testing, garnet paper actually wears out without making any headway against this Hycar rubber.

Hycar 1072 gives all the advantages of isocyanate rubber at considerably lower cost, besides providing easier processing. In addition, Hycar 1072 will provide high gum strength, good hot tensile and tear strength, and good oil resistance combined with resistance to ozone.

Hycar 1072 offers new opportunities for makers of caster wheels, skate wheels, hard rolls, loom parts, football shoe calks and shoe heels.

For further information about Hycar 1072, or information about any of the many other Hycar nitrile rubbers or latices, write Dept. CA-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
REG. U.S. PAT. OFF.
Rubber and Latex

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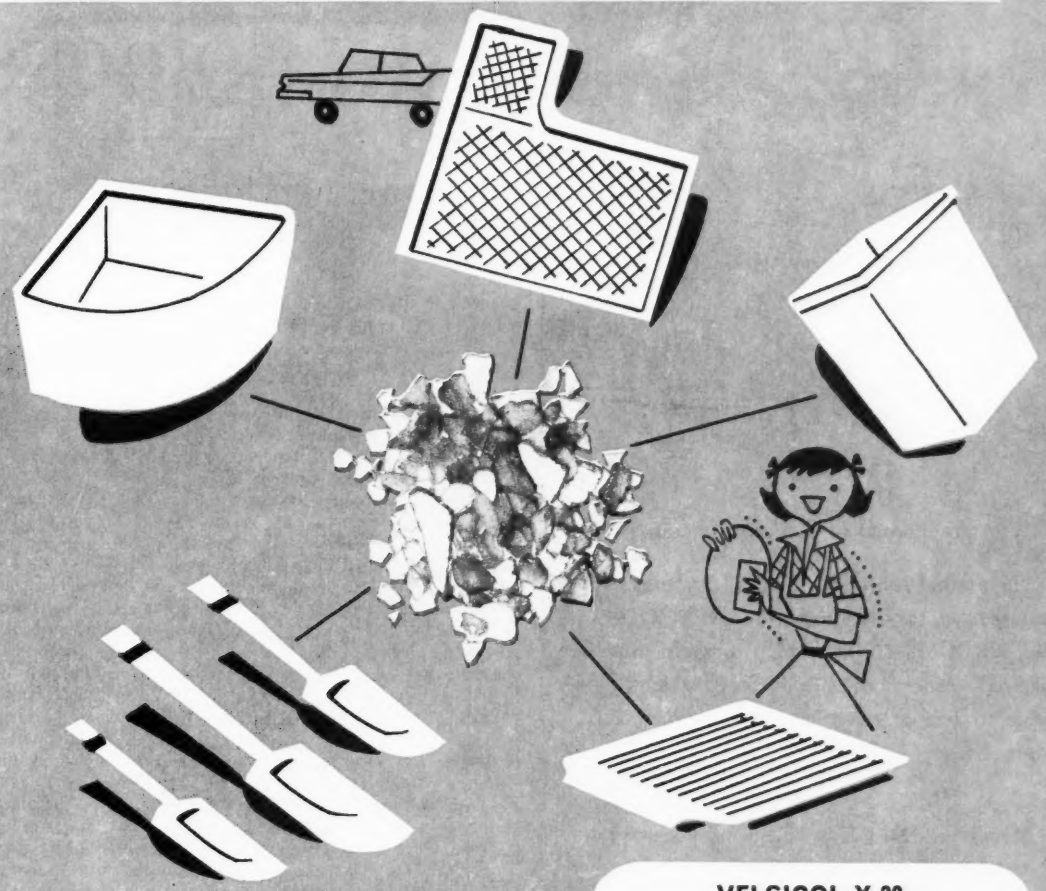
GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

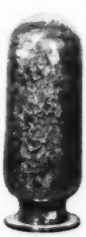
VELSICOL X-30 HYDROCARBON RESIN
makes mat stocks behave!



VELSICOL X-30
HYDROCARBON RESIN

Mat stocks and other stocks with high clay loadings can be made pliable and easy to process by adding Velsicol X-30 hydrocarbon resin to the recipe. X-30 enables you to use the highest clay loadings without sacrificing tensile strength, elongation, or processing characteristics. You'll get better milling, calendering, and tubing. Cures will be more uniform, and stocks non-scortchy. Toughness, hardness, and resistance to aging and abrasion will be improved. Raw materials costs will be lower, too. Write for complete information about Velsicol X-30 resin today!

PHYSICAL PROPERTIES,
VELSICOL X-30 RESIN



Type: Thermoplastic Hydrocarbon
Form: Flaked
Softening point (ball and ring): 210°—220°F.
Color (coal tar scale): 1½—2
Color (Gardner): 10-11
Color (Rosin scale): I—K
Acid No.: 0-2
Saponification No.: 0-2
Compatible with a variety of natural and synthetic rubber compounds. Has good electrical insulation properties, because it is a hydrocarbon polymer.

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☐ Please send test sample
☐ Please have salesman call
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Further details are easily obtained by writing to:

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TECHNICAL BOOKS

BOOK REVIEWS

"Vinyl Resins." By W. Mayo Smith. Reinhold Publishing Corp., New York, N. Y., 1958. 282 pages. Price, $5.75.

Reinhold has undertaken a noteworthy project in its publication of the "Plastics Applications Series" as a semi-technical guide to the use of important plastics materials and fabrication techniques. "Vinyl Resins" is the seventh to be published of the projected 15-volume series; all are relatively short (200 to 300 pages) and are intended to emphasize practical utilization of the material or process under discussion, rather than the chemistry, technology, or engineering underlying its development.

The field of vinyl resins is indeed a large one to cover adequately in a book of this size. In addition to the necessary emphasis on vinyl chloride polymers and copolymers and polyvinyl acetate and its alcohol and acetal derivatives, the author gives at least passing attention to polymers of vinylidene chloride, vinyl ethers, vinyl pyrrolidone, and vinyl carbazole. The opening chapter is largely devoted to a compilation of available production, consumption, and end-use figures through 1957 and some extrapolations to 1960. Chapter 2, on "Types and Properties," gives considerable attention to polyvinyl acetate and its derivatives, but vinyl chloride polymers and copolymers are discussed largely in general terms with surprisingly few numerical data on their properties.

A short chapter on "Chemistry" lists methods for the preparation of various vinyl monomers and gives a few random comments on their polymerization; this chapter is likely to confuse, more than enlighten, a reader unfamiliar with polymerization chemistry. The principal commercial processes for the manufacture of vinyl chloride and vinyl acetate resins are described in Chapter 4, which also contains brief discussions of fabricating by calendering, injection molding, and extrusion.

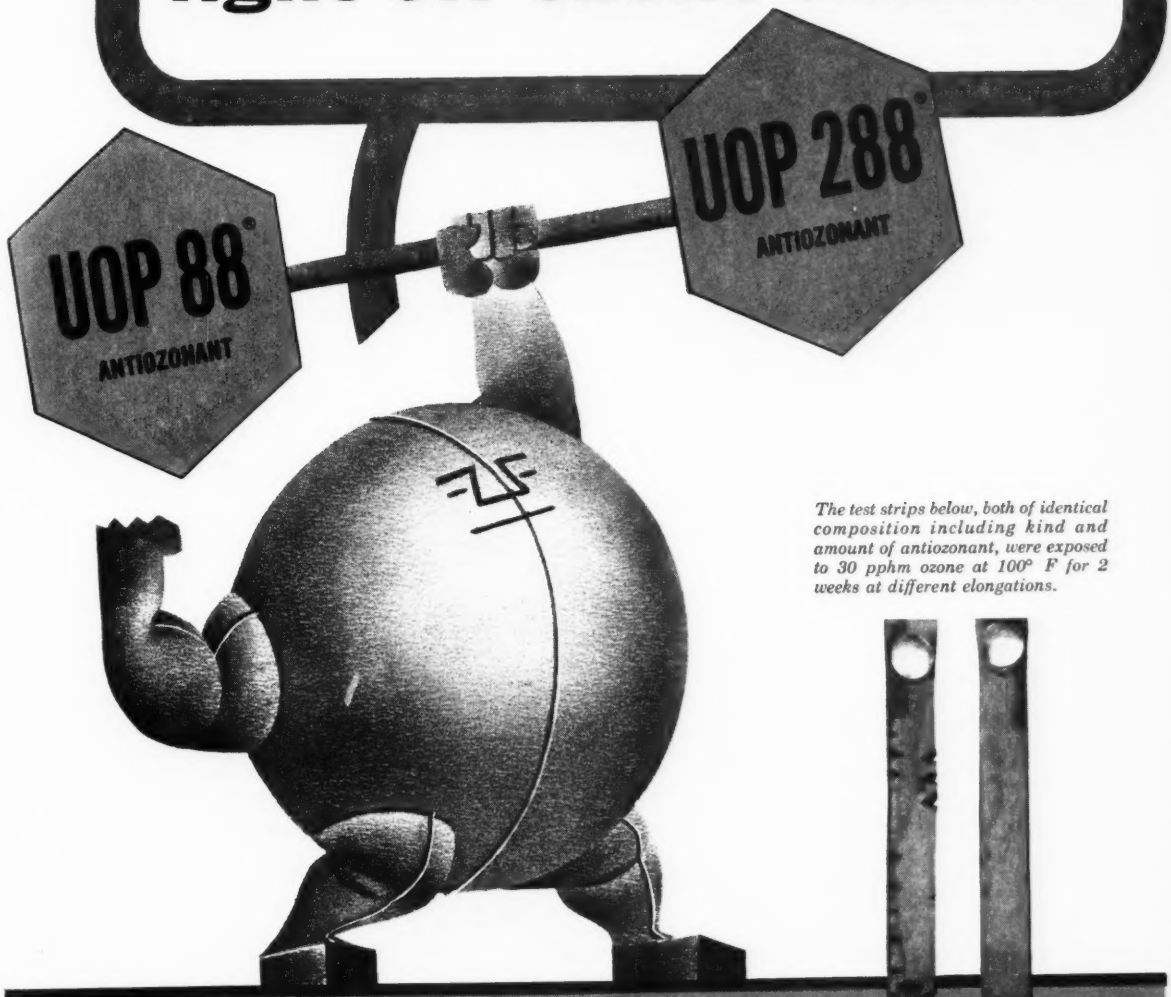
In the chapter "Applications," which occupies nearly half the book, the versatility of the vinyls is well illustrated by sections on film and sheeting, phonograph records, foams, adhesives, paints, wire coverings, flooring, solution coatings, and many other examples of both large- and small-scale application. The final chapter, on "New Developments," is principally concerned with two topics which seem rather out of place in a general book on vinyl resins—the polyvinyl chloride resins produced by a single manufacturer, and Delrin polyacetal resin.

There is a great deal of useful information in this book, but its value would be greatly increased by better classification and organization of the material presented. Much needless repetition could thus have been avoided, and the space saved might have been put to better use for more detailed descriptions of processing techniques and equipment, and more quantitative data on the effects of varied resins, plasticizers, stabilizers, and processing conditions on product properties. Other serious shortcomings are the lack of references or bibliography of any sort, the often confusing and ungrammatical sentence structure, the unsatisfactory index, which is too detailed in many entries and deficient in many others, and the generally superficial approach. As it stands, this book is a rather unsatisfactory effort to fulfill an important and worthwhile purpose.

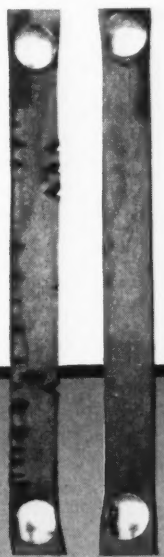
A. R. BERENS

"Elements de Science et Technologie du Caoutchouc." By Jean Le Bras. Third Edition, Published by S.E.T.C.O., 3 Square Petrarque, Paris, France (1958). Cloth, 6 by 9 inches, 453 pages. Illustrated. Price, 2,000 francs plus 400 francs postage.

how can rubber under STRESS fight off ozone attack?



The test strips below, both of identical composition including kind and amount of antiozonant, were exposed to 30 pphm ozone at 100° F for 2 weeks at different elongations.



The specimen on left, subjected to 20 percent elongation, shows severe ozone cracking.

Specimen at right, subjected to 10 percent elongation, shows no sign of ozone cracking.

Properly formulated, rubber can withstand ozone, even under severe dynamic service...

What happens to a well formulated rubber compound when the vulcanized product is subjected to inherent or applied stresses? Ozone attacks the surface of the product and severe cracks develop.

Hence the need for special ozone protection provided by UOP 88 and 288. Unlike other protective measures, UOP antiozonants extend their protection to products under heavy physical stress and dynamic flexing. With a relatively small increase in amount, you can give your product sufficient ozone protection to withstand greatly increased stresses.

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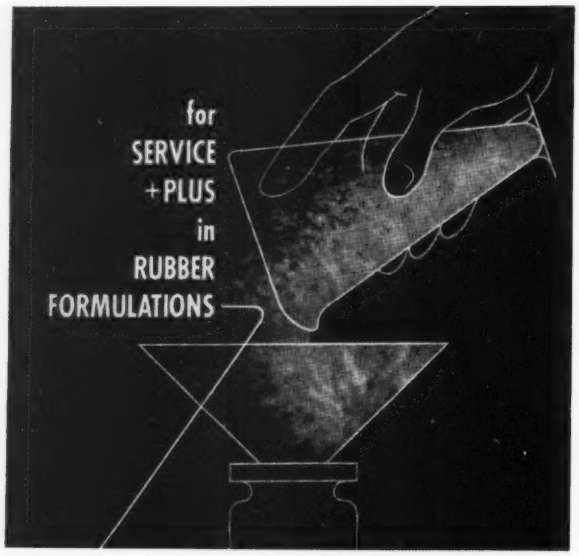

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Claremont has served the rubber industry for over thirty years as a supplier of quality flocks produced to fit specific requirements. Whether used inside or outside, as a filler or as a finish, the superiority of Claremont Cotton Flocks is recognized by all users.

Used as a compounding agent in the manufacture of mechanical rubber goods and general sundries, Claremont Flock Fillers provide reinforcement, improve tear and abrasion resistance. Claremont flock finishes for rubber fabrics provide a wide range of appealing textures that are uniform and long-wearing. In many applications the proper use of a Claremont flock will substantially reduce production costs.

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Interested exhibitors should contact Norman Bekkedahl, IRC Exhibit Chairman, National Bureau of Standards, Washington 25, D. C. (Phone EMerson 2-4040).

Technical Books

Prepared by Dr. Le Bras (inspector general of the Institut Français du Caoutchouc and allied institutes) and several collaborators, for use in training rubber technologists with very different educational backgrounds, the first edition of this useful textbook on rubber science and technology was published in 1951. Its clear and simple exposition of essentials made it the obvious choice when a basic manual was needed in connection with the decision to grant International Diplomas to rubber technologists who had successfully passed examination, following the lines long adopted by the Institution of the Rubber Industry in Britain.

A second edition was therefore published in 1953, and in 1956 and 1957, German and American versions appeared.

The recent third French edition embodies the improvements introduced in the foreign-language issues and, in addition, has been modified and expanded to cover latest developments in production, preparation, and compounding of natural rubber as well as of polymerization and polycondensation products. Indexes of authors and subjects are provided; for those interested in further studies, there are lists of French and foreign books, chiefly those published after 1945, besides several important earlier works.

NEW PUBLICATIONS

"Philprene 1712 Acceleration Study." Phillips Chemical Co., Akron, O. 6 pages. In this study, 16 combinations of sulfur and accelerator have been tested to present isopleth graphs showing how the various physical properties, obtained on a 30-minute cure at 307° F., are affected. Philprene 1712, a typical oil-extended polymer, was selected for developing basic compounding information.

"Silastic Notebook—Table of Contents." Dow Corning Corp., Midland, Mich. 1 page. This table of contents, dated May, 1959, supersedes the previous one. Additions of new data sheets include Silastic Stocks for Various Specifications, Silastic S-2071, Dow Corning A-4000 Adhesive, Silastic S-6535, Schedule for Curing Silastic in Thick Sections, and a new price announcement effective June 15, 1959. Silastic S-2071 is described as a red calendering-grade silicone rubber which can be used to coat glass fabric for seals, ducts, etc., in high-temperature applications. Silastic S-6535 is a silicone rubber paste, developed for the dispersion coating of glass fabric for similar applications. Dow Corning A-4000 is a silicone adhesive which cures at room temperature and is used for bonding Silastic, Silastic coated cloth, and other materials.

"Sulfur and Accelerator Requirements for Typical Shell S-Polymers." Synthetic rubber division, Shell Chemical Corp., Torrance, Calif. 12 pages. This bulletin shows the relative accelerator concentration that will provide a uniform cure cycle for each S-Polymer or Shell SBR. When the amount of accelerator needed for one S-Polymer is known, the level for any other can be quickly ascertained. Data are presented which readily indicate the ratios between scorch times of the different polymers. Graphs are also included which show the effects of various types of accelerators on physical properties and processing characteristics.

"Seven Plasticizers for Non-Toxic Applications." Monsanto Chemical Co., St. Louis, Mo. 10 pages. The properties and specifications of seven plasticizers recommended for non-toxic applications are described. Tables give comparative performance data for each plasticizer in terms of volatility, solvent and water resistance, low-temperature flexibility, cost, and compatibility with various plastic materials. The plasticizers are Santicizer 141, Santicizer E-15, Santicizer B-16, diethyl phthalate, dioctyl phthalate, diisooctyl phthalate, and diisobutyl adipate.

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QUESTION:

What new sulfenamide accelerator gives me long delayed-action for greatest safety from scorch without sacrifice of speed at curing temperatures?

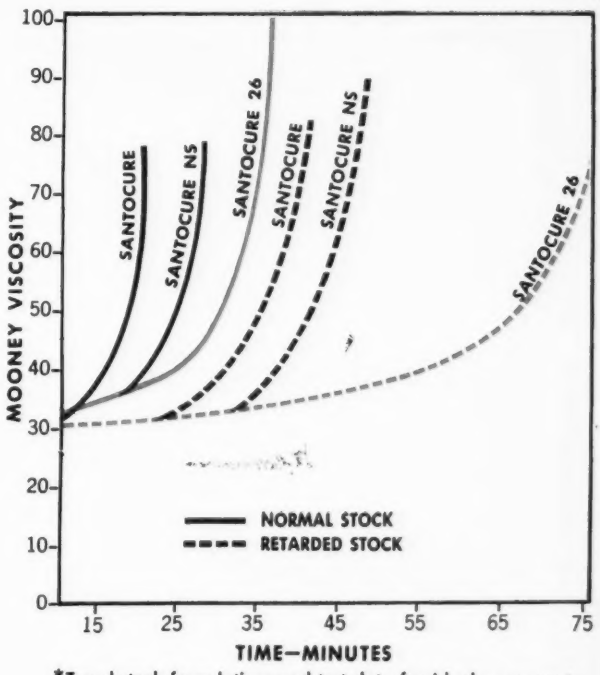
ANSWER:

New SANTOCURE 26

See how Monsanto's new SANTOCURE 26 compares with regular SANTOCURE and SANTOCURE NS—gives long delayed-action for greatest safety from scorch in a fast-curing natural rubber tread stock.* Now, with SANTOCURE 26, *you* can formulate around more extreme heat history without sacrifice of "mold-time" in *your* natural and synthetic rubber compounds.

Monsanto's family of sulfenamide accelerators give you the broadest range of controlled, delayed-action cures you can get. And SANTOCURE 26 protects *best* against premature curing of stocks from longer bin storage, higher processing temperatures, thicker sections, greater activation, prolonged time on the mill or calender and in the Banbury or extruder.

Storage and in-plant processing tests show that SANTOCURE 26 is the most stable sulfenamide accelerator you can use—gives day-to-day and season-to-season uniformity of cure. It responds to secondary accelerators and other compounding ingredients much the same as do other members of the SANTOCURE family. Try SANTOCURE 26 and see what it can do for scorchy stocks.



*Tread stock formulations and test data furnished on request.

Santocure: Monsanto T. M., Reg. U. S. Pat. Off.

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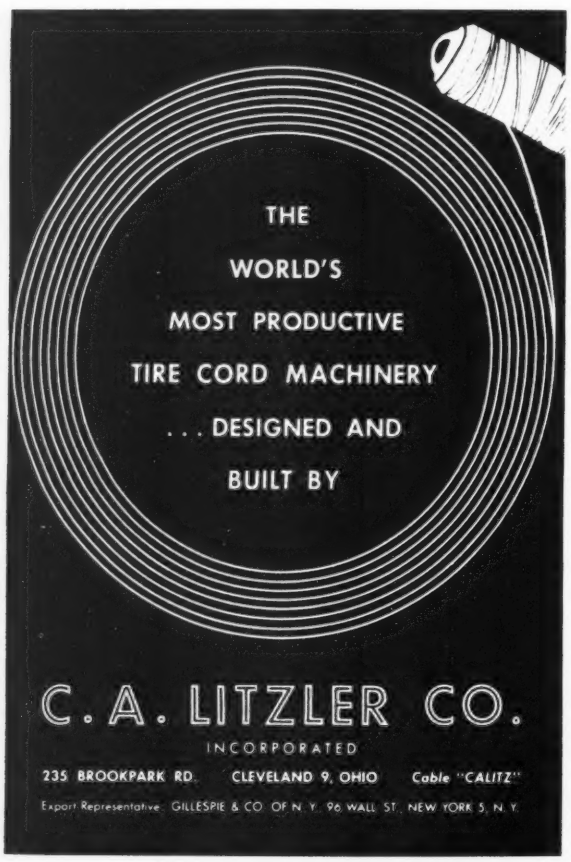
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Technical Books

"TMI Catalog and Register of Test'ng Machines." Testing Machines, Inc., Mineola, L. I., N. Y. 224 pages. This volume is comprised of 87 different broad categories of physical testing areas such as abrasion testing, hardness testing, thickness testing, moisture testing, and 83 similar broad classifications. Frequently there are 30 or more different machines catalogued under a given category. The equipment, manufactured by TMI and others, has been compiled from world-wide sources. Technical and purchasing executives may obtain a copy by writing to the company, but distribution is on a limited basis.

"The Resistance of Butyl Rubber to Water Absorption." Bulletin 110. Thiokol Chemical Corp., Trenton, N. J. 12 pages. The purpose of the study covered in this bulletin is to evaluate the resistance of butyl rubber to water absorption in relation to other elastomers and to determine the effect of cure systems and fillers used. A summary, test procedures, conclusions, and results in tabular form are included. Attached is an announcement that the firm's butyl technical group has become part of the polysulfide team.

"New Kenmix Dispersions." Kenrich Corp., Maspeth, N. Y. 7 pages. This bulletin describes several new Kenmix accelerator and catalyst dispersions, based on Kenflex resin. Included are Kenmix-stannous chloride (hydrate), Kenmix-stannous chloride (anhydrous), Kenmix-lead phosphate, and Kenmix-ferric chloride catalyst dispersions for butyl resin cures (dimethylol phenol resin). Also mentioned are Kenmix-HMDA-carbamate, Kenmix-Diak No. 1, Kenmix-Diak No. 2, Kenmix-hexa methylene tetramine, and Kenmix-zinc oxide-beutene for Viton. Literature references are included.

"Ameripol Micro-Black." Goodrich-Gulf Chemicals, Inc., Cleveland, O. 16 pages. This booklet provides information on the company's latex masterbatching of carbon and gives advantages of using Ameripol Micro-Black. Seven masterbatches are covered in this bulletin, including Ameripol 4650, 4651, 4652, 4654, 4655, 4750, and 4751. Chemical and physical properties and test recipes are given.

"Rewind Shop Procedures for RTV Encapsulation of Random Wound Motor Stators." Silicone products department, General Electric Co., Waterford, N. Y. 3 pages. Procedures in this bulletin describe a simple method of applying RTV-60 silicone rubber to a random wound stator, using readily available, inexpensive equipment. By encapsulating stator windings with a tough, resilient coating of RTV silicone rubber, dripproof motors are now being successfully used in many atmospheres which previously required the protection provided by more expensive totally enclosed motors.

"Use of Catalysts in Preparation of Neopentyl Glycol Polyesters." TDR #N-106. Eastman Chemical Products, Inc., Kingsport, Tenn. 10 pages. This technical data report covers recent work in the catalytic reaction of neopentyl glycol with dibasic acids to form hydroxy terminated polyesters. Certain problems inherent in the past in these polyesterification reactions have been largely overcome with the development of suitable catalysts systems including those based on tin, antimony, and aluminum. This report describes these systems and details the corresponding reactions.

"Polygard." C. R. R. No. 28-A. By R. R. Barnhart. Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn. 20 pages. This report describes and gives applications for Polygard, tri (nonylated phenyl) phosphites, a completely non-discoloring and non-staining stabilizer recommended for synthetic polymers. It is said to impart excellent protection against gel build-up and heat deterioration. Other advantages summarized in the report are: improved physical properties of the vulcanizates; resistance to plasticity variation due to heating or milling; and lightest colored raw polymer.

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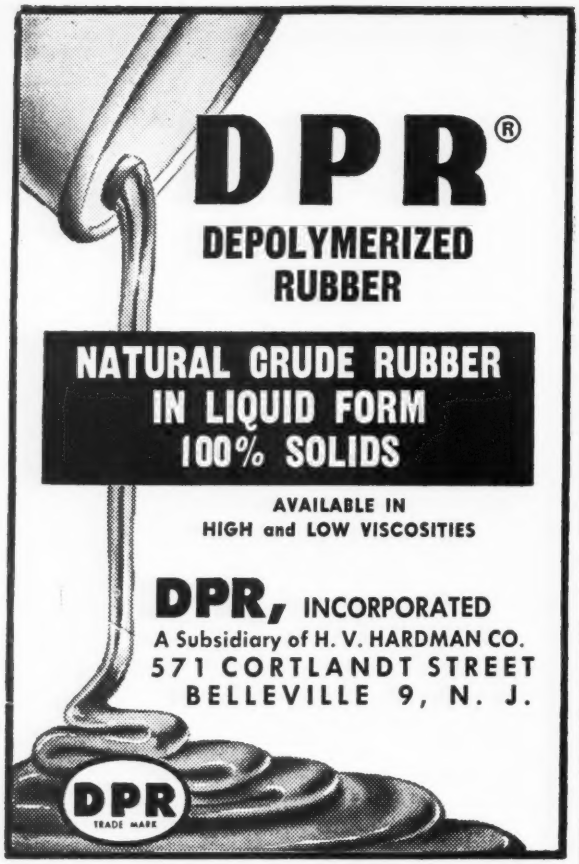

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Technical Books

"Huber's CWF," J. M. Huber Corp., New York, N. Y. 4 pages. This bulletin describes Huber CWF, a new kaolin clay standard for the latex compounder and the textile industry. This circular outlines the physical properties and contains charts showing particle distribution and characteristics of CWF in water suspension. It also describes improvements to be achieved in pigment-water slurries, finished compounds, and film properties.

"Cane Wax Aids." Warwick Wax Division, Western Petrochemical Corp., New York, N. Y. 8 pages. The use of three sugar-cane waxes as rubber processing aids is studied in this booklet. The results of extended tests of these wax products—S. C. Crude, S. C. Wax Oxidized, and S. C. Resin—are detailed in tabular form. Property improvements resulting from the use of the waxes are better extrudability, lengthened scorch time, less blocking, and reduced shrinkage.

Publications of the chemical division, The Goodyear Tire & Rubber Co., Akron, O.:

"Plioflex 1507 Pigmentation Study." PF-23. Tech-Book Facts. 8 pages. This study was undertaken to furnish compounding information on Plioflex 1507, a new non-staining, medium low Mooney viscosity, cold SBR. Loadings of three blacks and four pigments were studied. Loading levels of pigments and curing levels used were similar to previous pigmentation studies. Recipes and vulcanizate properties are presented in tabular form.

"Plioflex 1714C Pigmentation Study." PF-24. Tech-Book Facts. 8 pages. This bulletin presents results of pigmentation study which furnishes compounding information for Plioflex 1714C, a new 50-part highly aromatic oil-extended SBR. As a staining-type rubber, Plioflex 1714C finds application in low-cost tires, camelback, wire and cable coverings, and molded and extruded mechanical goods.

Publications of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.:

"Neoprene Latex Type 400." Report No. 59-1. By R. O. Becker. 10 pages. Neoprene Latex Type 400 is the latex of a resilient, high modulus polymer, said to have twice the heat resistance, three times the tear strength, and 15 times the ozone resistance of neoprenes from other available latices. Characteristics, compounding data, and application information are covered.

"Underwriters' Reports on Hypalon in Types RHW and RHH." 64 pages. This is a copy of Underwriters' Laboratories reports on the investigation of Hypalon 20 for Types RHW and RHH building wire. This compound met the requirements for both wires, and, in addition, a single extrusion served as both insulation and jacket. A report for each type of wire includes a section on introduction, description, plan of investigation, test record, conclusion, and recommendation.

Naugapol Masterbatch

(*Continued from page 660*)

its low ash, low water absorption, and wire grade characteristics. The rubber portion of the oil-extended SBR used in Naugapol KO-50 is made to high Mooney viscosity. When Naugapol KO-50 is used in high percentages in a compound, the finished stock may seem somewhat difficult to process. A moderate amount of additional milling, such as an extra Banbury pass to add curatives, will correct this apparent stiffness. For optimum physical properties the stock temperature should reach a minimum of 225° F. to be certain that the high styrene resin is fluxed.

A technical bulletin, No. 228, available from the company, describes the use of Naugapol KO-50 in laboratory studies of high-quality and medium-quality SBR shoe soles and in an SBR floor tile.

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Wellington Sears, with over a century of experience, would welcome the opportunity to help you solve problems related to fabrics, in rubberizing, coating, laminating, or any combination of textiles with other materials. For a useful booklet, "Fabrics Plus," write Dept. H-8.

Preparing to put up Pentadome, made by Birdair Structures, Inc., Buffalo, New York. Wellington Sears nylon base fabric was vinyl-coated by Sawyer-Tower, Incorporated, Watertown, Mass.

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oil, cold SYNPOL 8200 is glue-acid coagulated to reduce water-soluble content, and is particularly well suited for electrical and other low moisture absorption applications.

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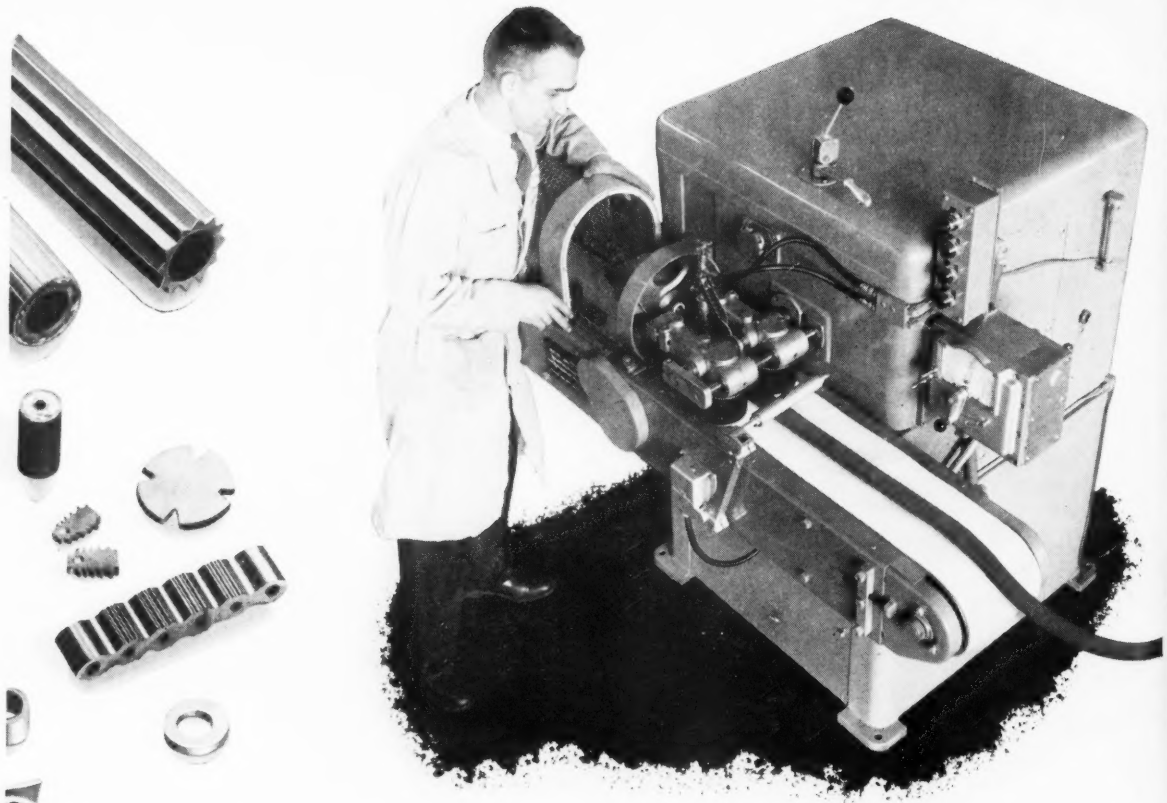

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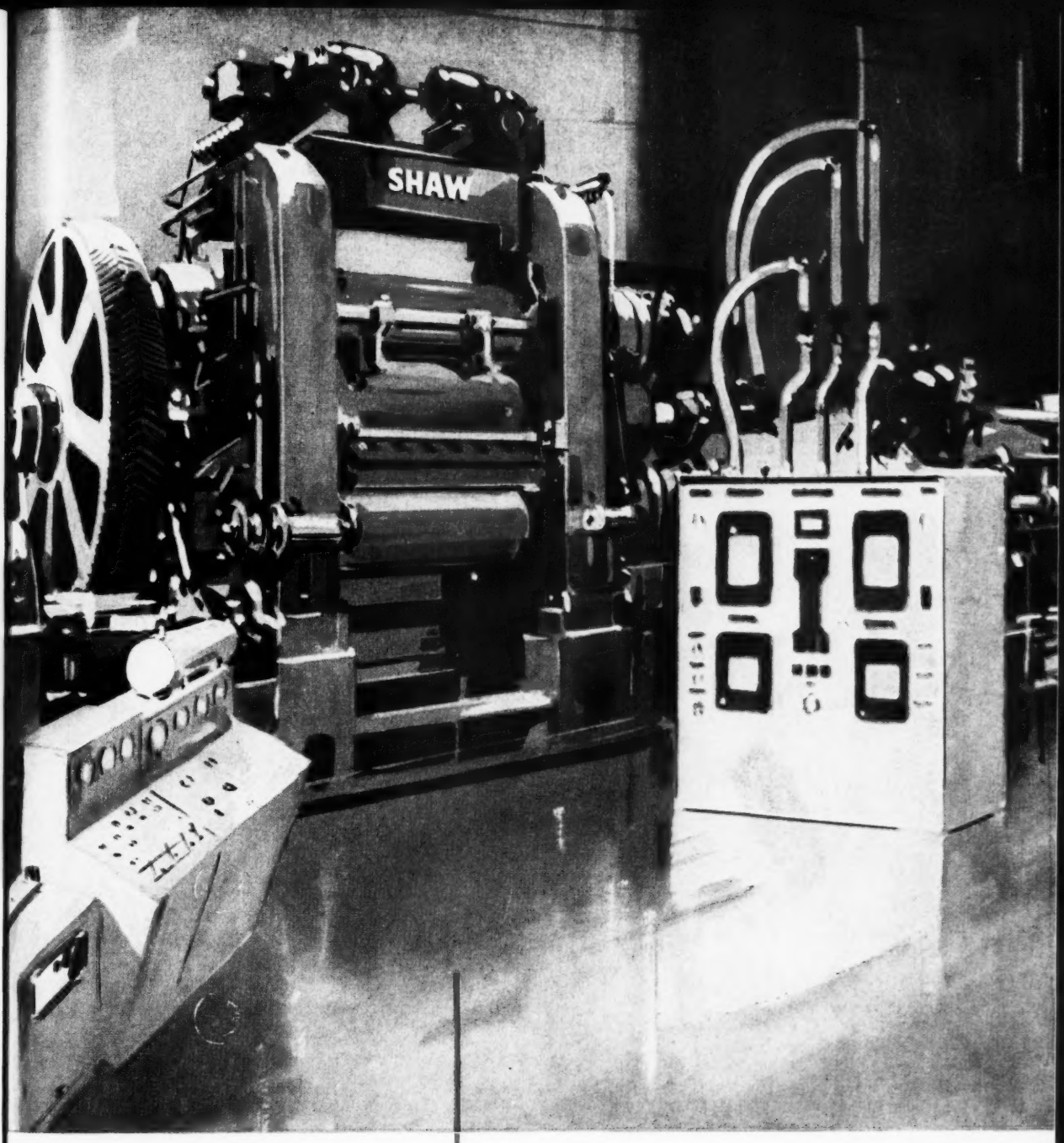

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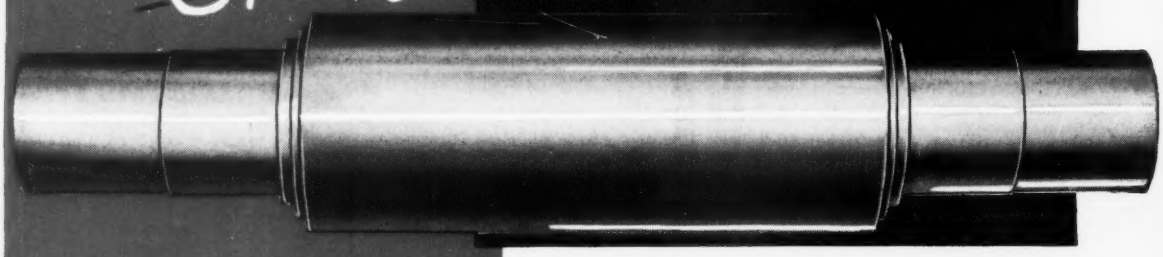

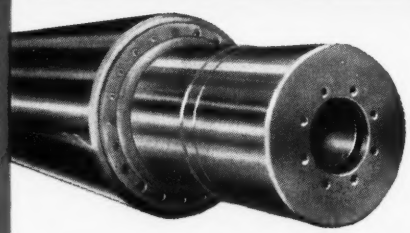

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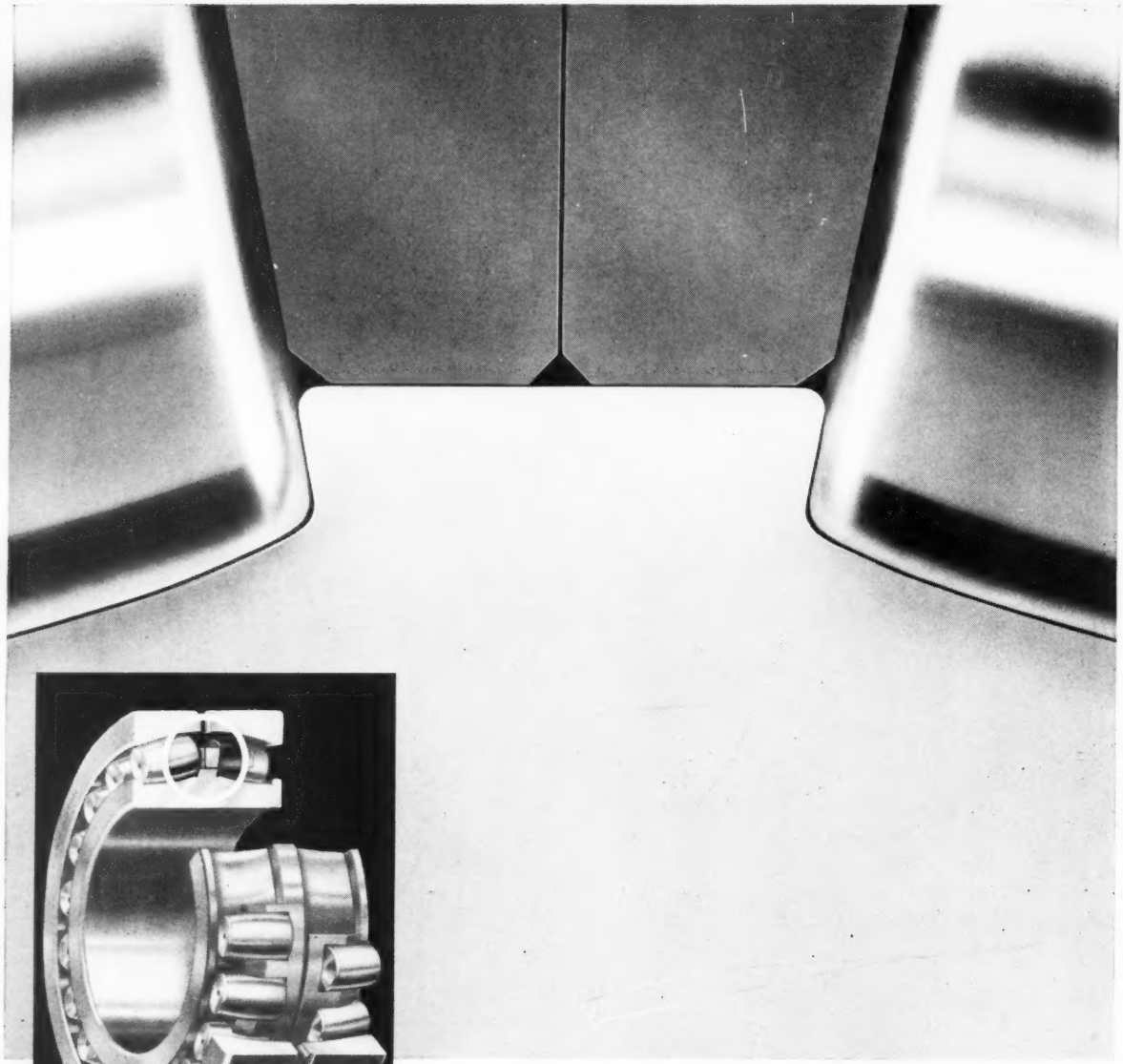

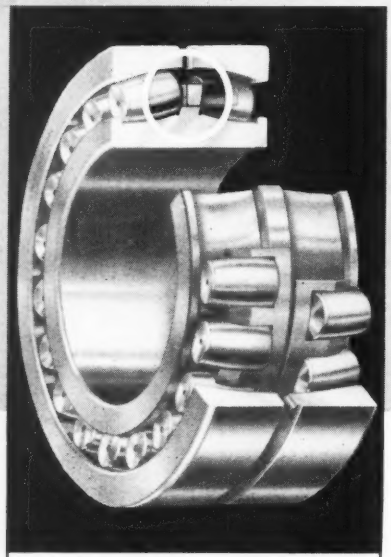

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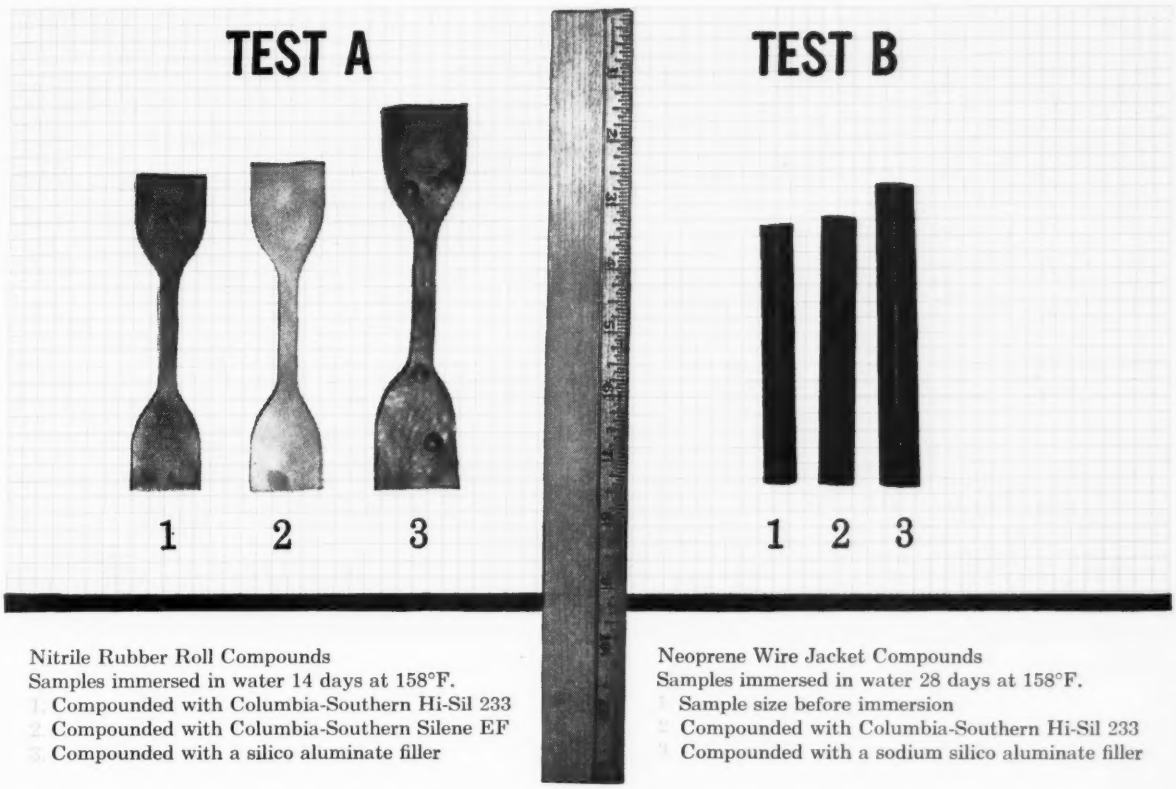

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Total Sulfur	.15	.32
Gritty Particles: (Silica, Dust, Dirt, Metallics)	Present	Present

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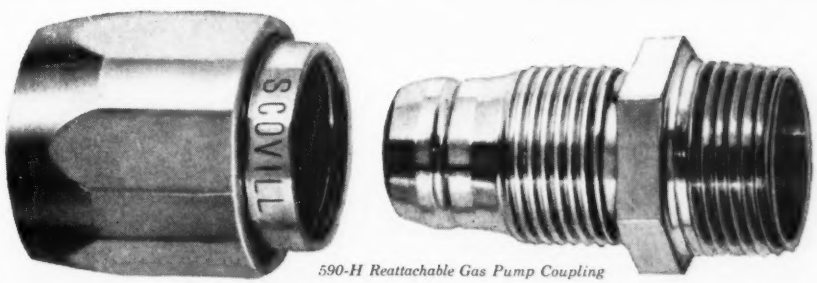

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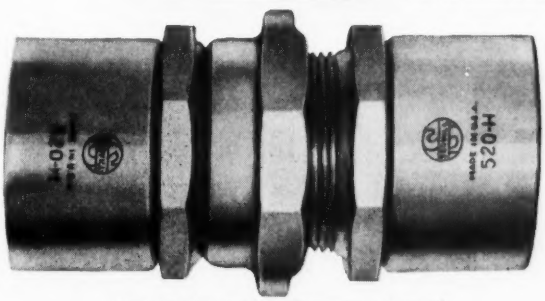

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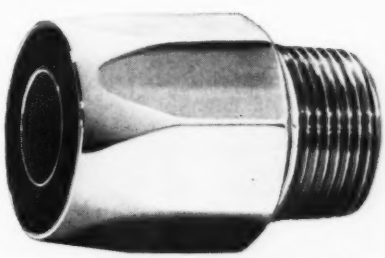

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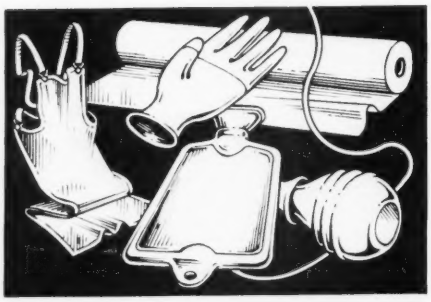
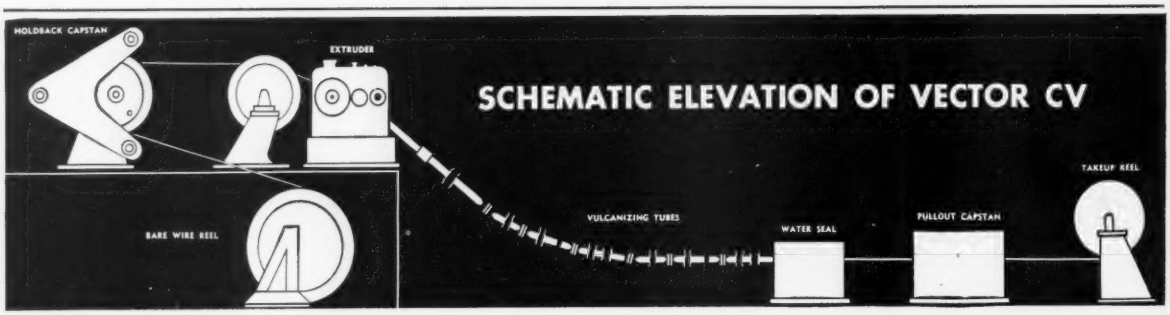


Factice
THE STAMFORD RUBBER SUPPLY CO.
Vulcanized Oil

THE STAMFORD RUBBER SUPPLY CO., STAMFORD, CONN.



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ANALYSIS: IGNITED BASIS						
SiO_2	0.04%	0.4%	0.7%	2.4%	0.11%	0.03%
Fe_2O_3	0.03%	0.2%	0.4%	0.07%	0.02%	0.02%
AL_2O_3	0.11%	0.1%	0.1%	0.04%	0.03%	0.06%
CaO	1.36%	1.3%	1.4%	0.49%	0.30%	0.94%
SCREEN TEST						
thru 200 mesh	100%	100%	93% or		100%	100%
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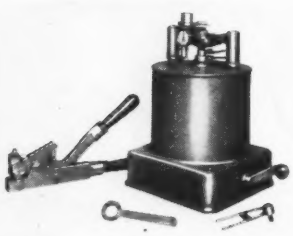

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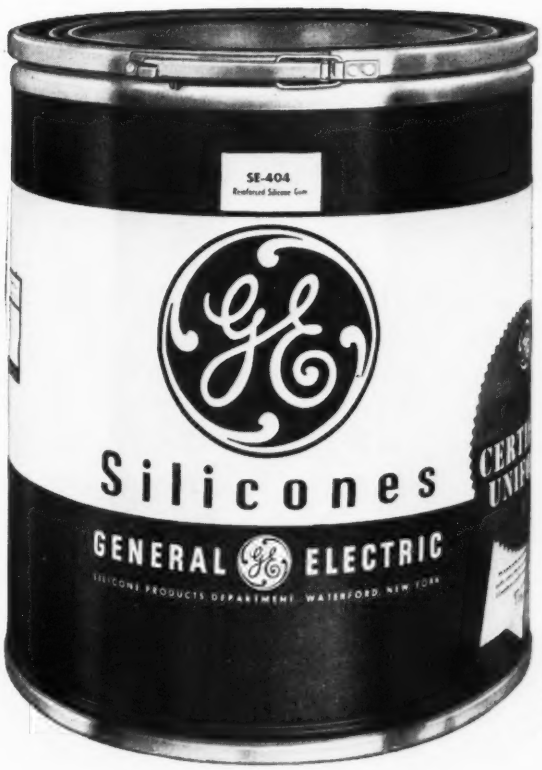

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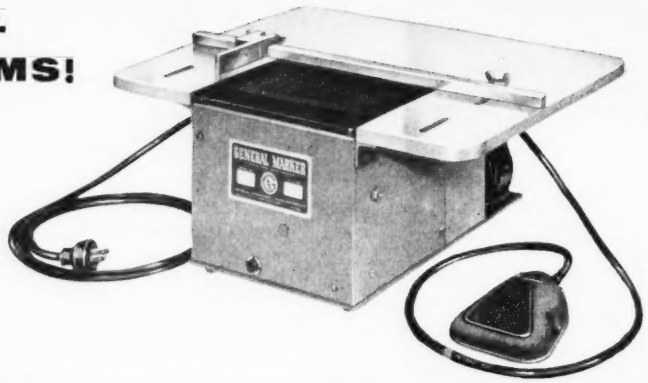

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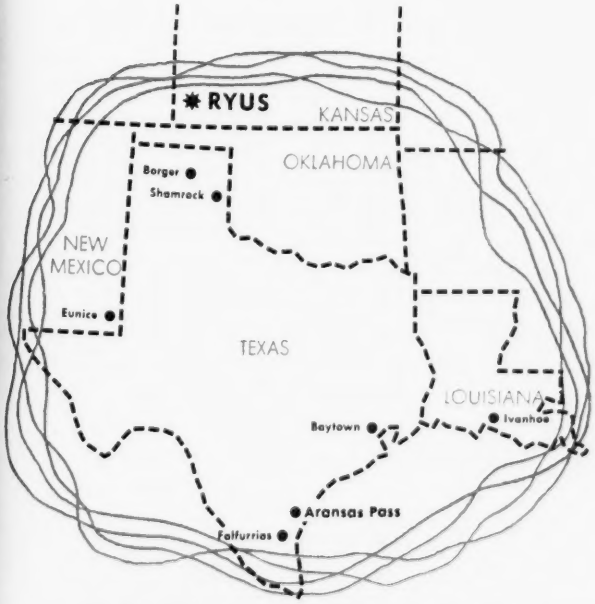

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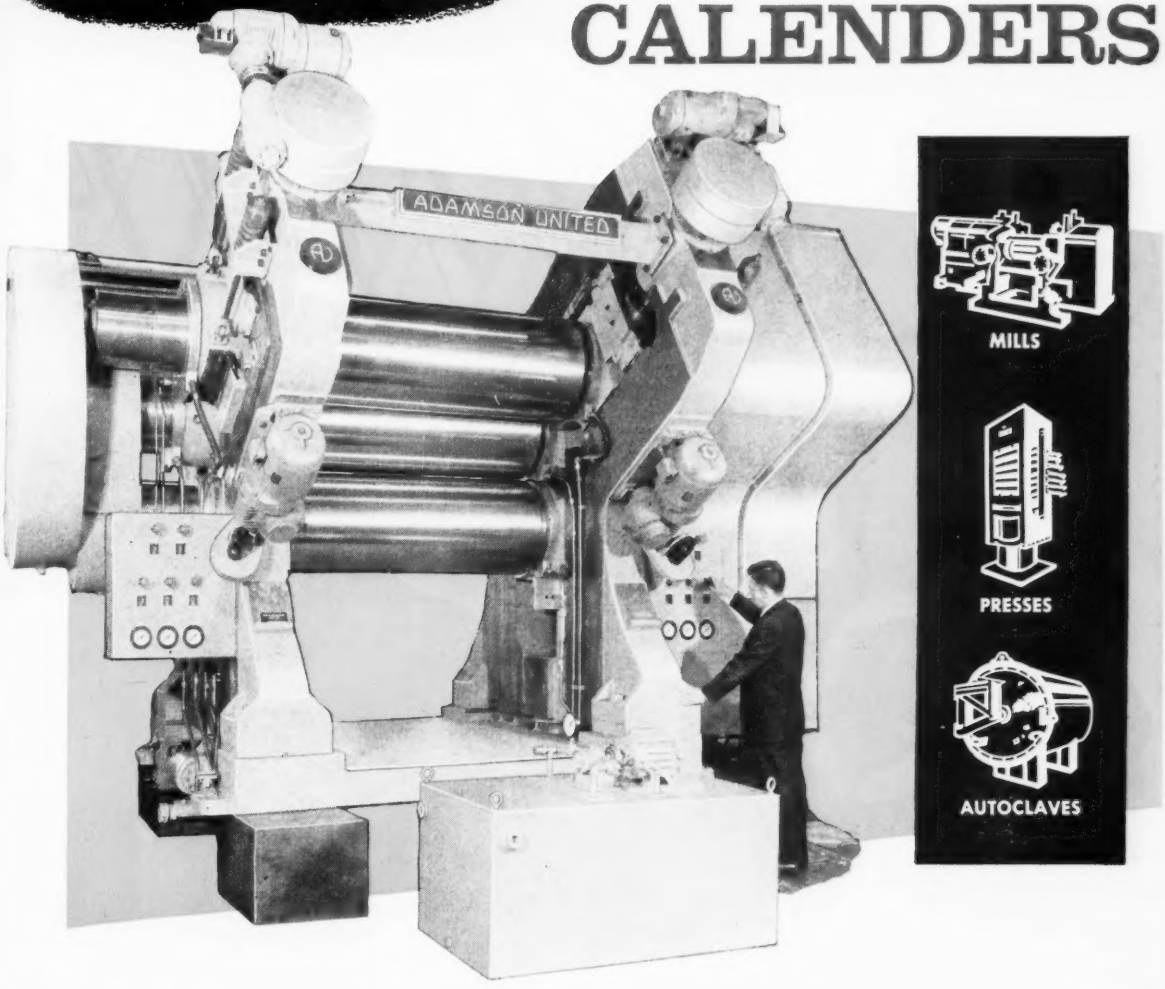

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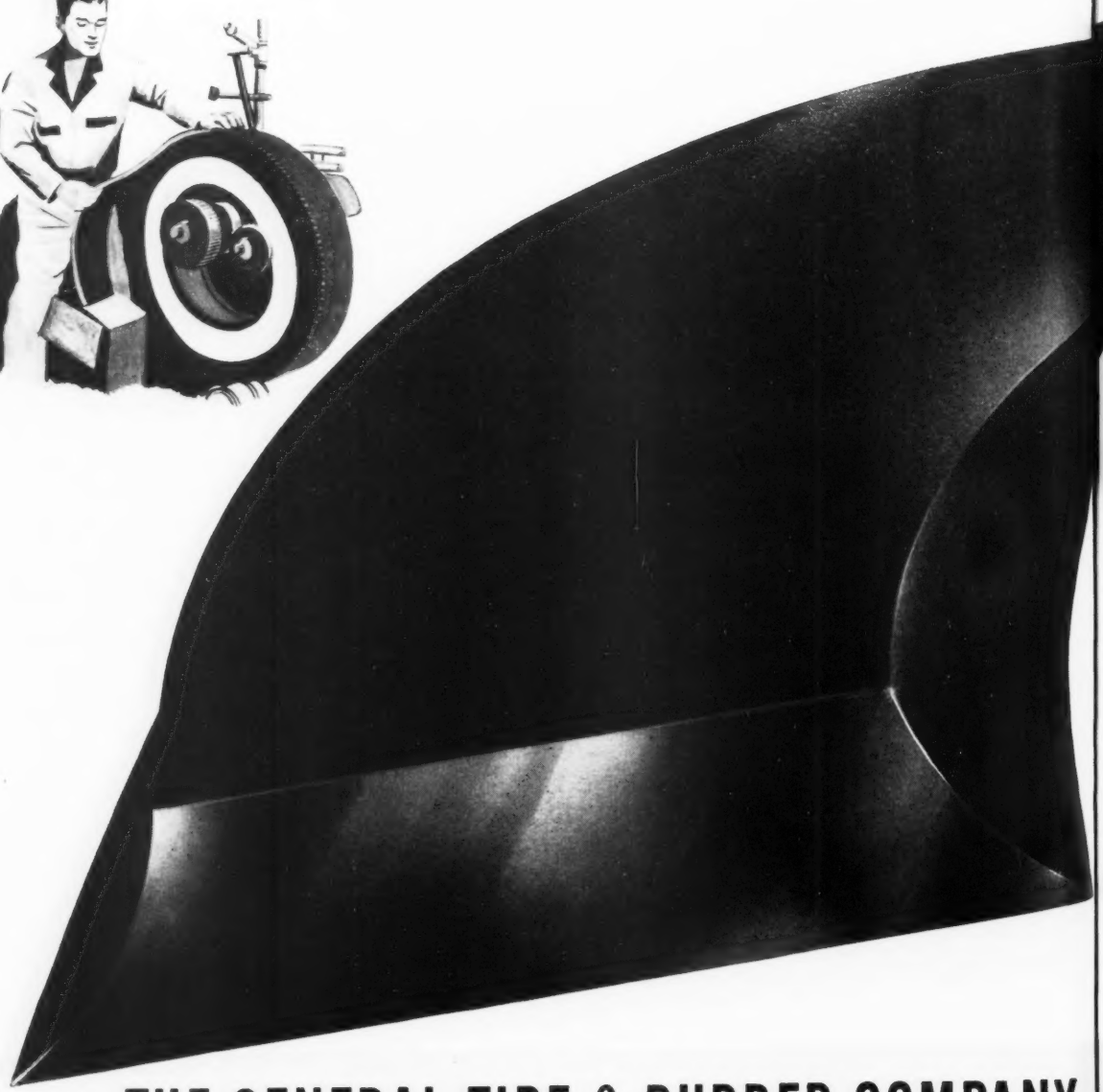

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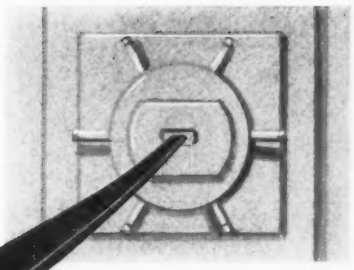

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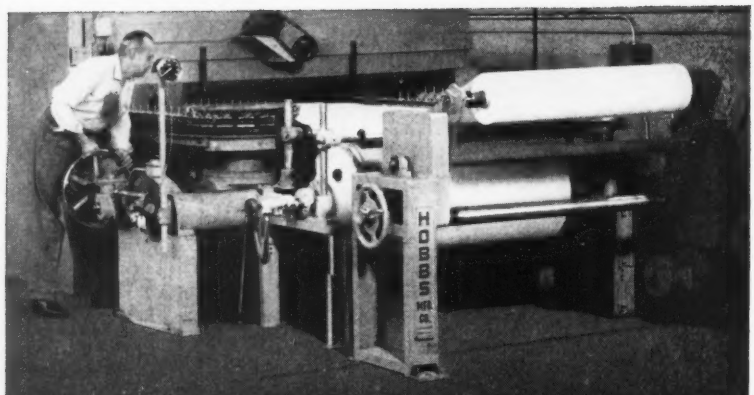

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Letters to the Editor

The article, "Trends in Rubber Research," by A. V. Tobolsky, in our March, 1959, issue produced several interesting letters which have been published in this column. Another such letter received recently is reproduced herewith.

July 3, 1959

DEAR SIR:

We read with interest the article by A. V. Tobolsky, of Princeton University, titled, "Trends in Rubber Research."

The article was interesting, and we believe that Dr. Tobolsky's six major categories of requirements for synthetic rubber are well taken and quite complete. It should be understood, however, that many times a rubber is required which has several of these requirements all in one rubber, as, for example, a swell resistant rubber with reasonably good high- and low-temperature properties.

With reference to Dr. Tobolsky's classes of rubber and the filler-rubber bond, we believe more research should be done on the dispersion of ingredients, not only the fillers, but anything that tends to agglomerate, as an agglomeration drastically reduces the physical properties obtained.

We have no experience with stress relaxation techniques, nor with radiation cures, but we have had quite a lot of high-temperature field experience with tetramethyl thiuram disulfide cured natural rubber and SBR. While the stress relaxation technique shows natural rubber to have less stress relaxation than SBR, our field experience shows SBR to be better than natural rubber for this service. We would, therefore, not put too much reliance on this method of evaluation until more work has been done to correlate these results with actual service experience, even though this approach does seem to be most logical.

C. P. MCHUGH

Director of Research & Product Design,
Raybestos-Manhattan, Inc.,
Manhattan Rubber Division,
Passaic, N. J.

This is one of the many comments on "Available Dry Styrene-Butadiene Rubbers," June, 1959, issue.

June 27, 1959

DEAR SIR:

Your article in the June issue of RUBBER WORLD, "Available Dry Styrene-Butadiene Rubbers," written in conjunction with Mr. C. A. Carlton, is one of the most interesting and timely of the many good articles this magazine has published over the years.

L. SHEDDEN

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RUBBER WORLD
EDITORIAL

"The Challenge of Marketing Rubber In the Coming Decade"

"The Challenge of Marketing Rubber in the Coming Decade," which was the subject of a talk of A. K. O'Keefe, president, Texas-U. S. Chemical Co., before the chemical marketing group of the local New York Section of the American Chemical Society on June 3, was underscored in July by the visit to this country by Sir Geoffrey Clay, the recently appointed Controller of Rubber Research for Malayan natural rubber producers.

Sir Geoffrey has as his primary responsibility the coordination of research and other activities of the Rubber Research Institute of Malaya, the British Rubber Producers Research Association, and the Natural Rubber Bureau in this country. During his present visit he hopes to learn about the needs of the American consumer of natural rubber and about progress being made with natural's competitor, synthetic rubber. Consideration is being given by Malayan producers to the establishment of a technical service organization in the U. S., similar to that used by American synthetic rubber producers.

We directed Sir Geoffrey's attention to the summary of problems confronting the producers of styrene-butadiene rubber (SBR) in marketing this rubber, as given by Mr. O'Keefe in his paper, since we could not help but observe the applicability of these problems to natural as well as synthetic rubber. For example, Mr. O'Keefe first listed "a rapidly expanding technology which has created an unusually large number of competitive polymer types and packages," certainly a major problem for NR producers who must compete with 150 grades of SBR as well as with numerous grades of other synthetic rubbers.

SBR producers must contact an increasingly greater number of rubber companies and people in these companies, and then there are the unique needs of foreign consumers and the "very special requirements of getting American SBR technology into their hands." NR producers, if they decide to provide technical service to American consumers and others, will have the same problem.

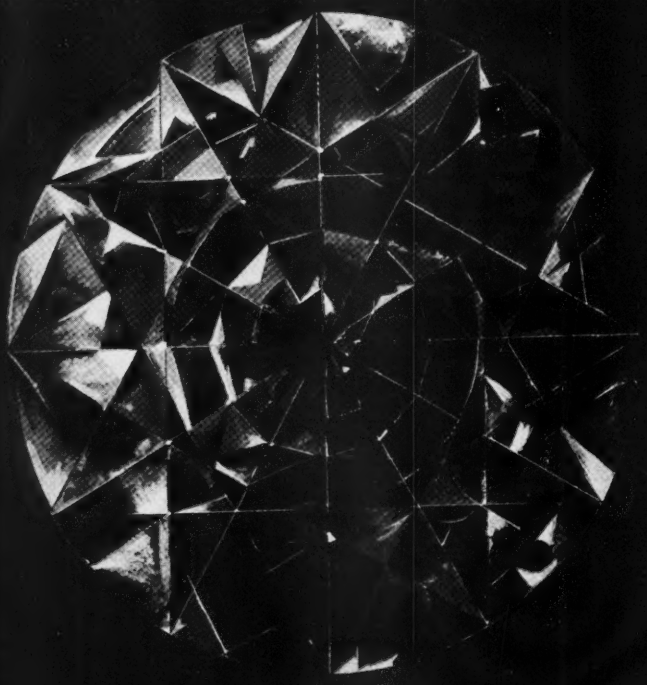
Another point made by Mr. O'Keefe will require serious consideration by NR producers, that is, "changing needs of the customer with one of the most significant being his apparent desire to have the producer carry out more of the basic compounding operation." A knotty problem, this one, for NR producers in the Far East.

SBR producers are concerned about the profit squeeze resulting from prices stabilized at a rather low level and the increased selling costs incurred by increased production costs resulting from new manufacturing facilities, stricter color requirements, and greatly escalated raw material, service, and labor costs. NR producers will have most or all of these same cost problems also if one of their objectives is to be achieved, that is, "better quality at a price low enough to give preference over synthetic rubber," and the profit squeeze will become significant for them.

The challenge of marketing rubber in the next decade applies to both natural and synthetic rubber producers, and there is much evidence that the consumers may expect to gain much therefrom.

R. G. Seaman

EDITOR



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RUBBER WORLD

A. E. Juve

Mooney Cure Tests for Calculating Curing Times[1]

By A. E. JUVE

B. F. Goodrich Research Center, Brecksville, O.

THE usefulness of the data obtained in a Mooney cure test beyond the scorch time as a measure of the rate of cure has been recognized for some time.[2-4] The usefulness of the data in setting an "optimum" or "equivalent" curing time was suggested by the author in a communication to the Office of Rubber Reserve in 1945 and was also suggested by him in the chapter on Physical Test Methods in "Synthetic Rubber."[5] In this reference it was stated that " . . . . the time required to reach the approximate optimum could be calculated from the Mooney cure data by assuming that this time is made up of the scorch time and the product of a constant and the time required for the viscosity to increase above the minimum viscosity to a fixed number of units."

The equation suggested at that time was:

$$\text{Curing time} = T_s + 6T_{\Delta 30} \qquad (1)$$

where:

T_s = the scorch time based on the last lowest viscosity reading preceding a consistent rise in viscosity, and

$T_{\Delta 30}$ = the time required for a rise of 30 units beyond this point. All tests at that time were run using the small rotor.

For reasons which will be discussed later, this equation has been revised slightly. This suggestion was based on the simple argument that the time to reach an "optimum" cure is dependent on the length of the induction period, which is measured by the scorch time, and some function of the rate of cure after cure begins. The rate of cure in this case is measured by the rapidity with which the viscosity increases an arbitrary number of units beyond the scorch point.

ASTM Method D 1077 for determining the curing characteristics of vulcanizable mixtures during heating by the shearing disk viscometer[6] is in the process of general revision, one part of which will be to include procedures for abstracting cure rate information from the cure curve.

A typical cure curve for the proposed revision, together with the conventions for reporting the data, is shown in Figure 1. This illustration differs from that in the present method in that the cure rate factor is shown as the time required for the viscosity to increase 30 units beyond the scorch time. The cure rate is indicated by this time and may be reported as the average viscosity increase, in Mooney units per minute, during this period.

Sensitivity and Reproducibility of the Test

A test method for measuring the cure rate must be sensitive to small differences in cure rate to be acceptable. It must at the same time be reproducible.

The simplest way to demonstrate the sensitivity is to make systematic changes in a composition which it is known will change the cure rate, and by means of the Mooney cure test determine the response of the test to

[1] Presented before American Society for Testing Materials Committee D-11 on Rubber and Rubber-Like Materials in Pittsburgh, Pa., Feb. 6, 1959. This article appeared also in the July, 1959, *ASTM Bulletin*.

[2] R. Shearer, A. E. Juve, J. Musch, India RUBBER WORLD, 117, 216 (1947).

[3] A. G. Veith, American Society for Testing Materials, Philadelphia, Pa., (1952). Issued as separate publication, ASTM STP No. 136, pp. 33-49.

[4] R. D. Stiehler and F. L. Roth, *Ibid.*, pp. 50-66.

[5] G. S. Whitby, "Synthetic Rubber," p. 428. John Wiley & Sons, Inc., New York, N. Y., (1954).

[6] "1958 Book of ASTM Standards," Part 9, p. 1163.

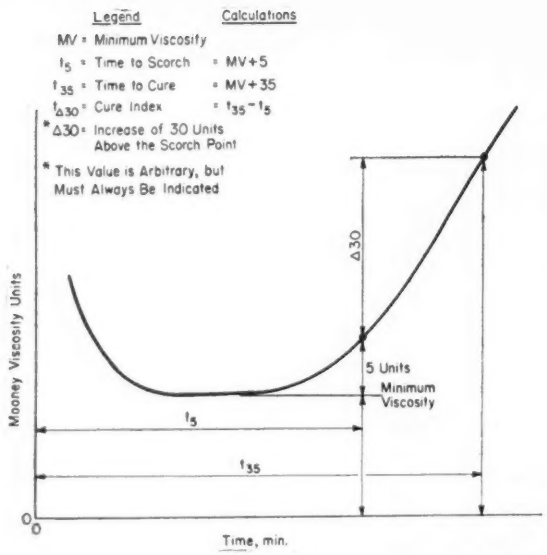


Fig. 1. Typical curve for proposed revision to ASTM D 1077 Mooney viscosity and curing characteristics test method

these changes. We ran one such test some years ago on an SBR stock that was accelerated with *N*-cyclohexyl-2-benzothiazolesulfenamide and activated with 0.25-part per hundred parts of rubber (phr) of an aldehyde-amine accelerator. Tests were run on the normal recipe and with two modifications in which the aldehyde-amine was increased by 0.05-part and decreased by 0.05-part. The uncured stocks were stored at constant humidity, and daily tests were run for 12 working days. The results are summarized in Table 1.

A further study of the same composition in which the aldehyde-amine accelerator was varied from zero to 0.40 phr provides additional data. These tests were run at both 280 and 300° F.; the data are shown in Figure 2. The regularity of the relation found is good evidence of the sensitivity of the test.

TABLE 1. EFFECT OF SMALL CHANGES IN CONCENTRATION OF SECONDARY ACCELERATOR

Aldehyde-amine concentration, phr	0.20	0.25	0.30
Average of 12 tests, min.*	7.6	6.31	5.4
Standard deviation, min.	0.3	0.23	0.11

* Time for viscosity to increase 20 units beyond minimum.

TABLE 2. EFFECT OF TEST TEMPERATURE ON REPRODUCIBILITY

Test Temperature	248° F. Avg. Time	248° F. Std. Dev.	284° F. Avg. Time	284° F. Std. Dev.	320° F. Avg. Time	320° F. Std. Dev.
(A) t_5, min.	23.93	1.27	7.13	0.342	3.59	0.122
$t\Delta_{30}$, min.	6.29	0.685	1.65	0.186	0.585	0.072
(B) t_5, min.	24.4	0.31	7.51	0.136	3.63	0.023
$t\Delta_{30}$, min.	6.46	0.536	1.59	0.134	0.52	0.040
(C) t_5, min.	19.61	1.14	5.24	0.263	2.64	0.115
$t\Delta_{30}$, min.	12.13	1.05	2.07	0.137	0.695	0.038

A paper[7] on the effects of moisture on the rate of cure of guayule in a modified American Chemical Society recipe lends some support to the claim that this is an exceedingly sensitive test for cure rate. The essential data are shown in Figure 3. The marked dependence of cure rate and scorch time on moisture content are well illustrated. The moisture contents were determined analytically.

In another study designed to obtain a measure of reproducibility, three different stocks were tested at each of three test temperatures for 10 weeks. A summary of the results is given in Table 2.

Temperature of Test

The temperature of the test may be varied over a wide range with reliable and reproducible results. For

[7] R. H. Taylor, F. E. Clark, W. P. Ball, *Rubber Chem. Tech.*, XXVII, 762 (1954).

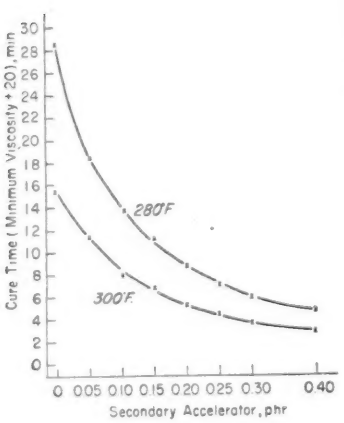


Fig. 2. Effect of change of secondary accelerator on cure time expressed as time to reach minimum Mooney viscosity plus 20 units

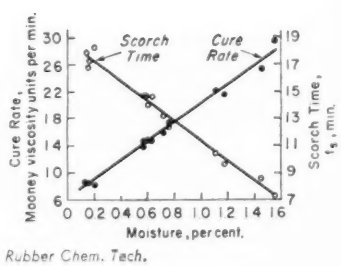


Fig. 3. Effects of moisture on the rate of cure of guayule in a modified ACS recipe

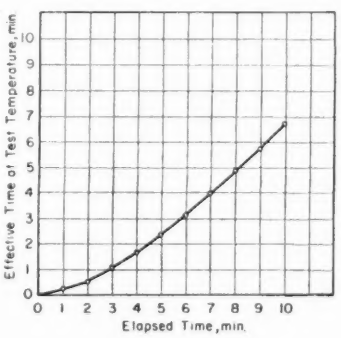


Fig. 4. Correction curve for time lag for specimen to reach the test temperature

Cure Time Obtained from Mooney Tests

The author, A. E. Juve, first proposed using the continuation of the Mooney scorch test for calculating cure times in 1945. His idea, restated several times, is to use Mooney viscometer data for setting "optimum" or "equivalent" cure times. This current report contains some of the latest developments based on the use of the method with some refinement in the original equation and mentions some pitfalls to be avoided in using this system, with information on how to avoid these pitfalls.

In this revision it is suggested that the large rotor be used whenever possible; therefore a new numerical constant is required. The original equation was curing time $= T_S+6T\triangle_{30}$, and it is now proposed to use a factor of 10 in place of the 6. The author states that this factor of 10 will generally give good correlation with the selection of optimum cure from stress-strain *(versus)* time of cure considering both tensile strength and modulus development, but that if the factor 10 does not give good correlation with the selection of optimum cure, a factor can be calculated that will.

Examples are presented to show that this correlation exists. Calculated cure times are compared with stress-strain determinations for natural, SBR, butyl, nitrile rubber and neoprene compounds. In dealing with a stock said to have an optimum cure based on some other property than stress-strain, the Mooney cure test can be utilized to judge the effects of compound variations by first determining what constant in the formula will give the accepted value for optimum cure.

It was concluded that the Mooney cure test is sensitive and reproducible, but because the test involves only the early part of the cure period, it is necessary to exercise care in assuring that accurate measurements are obtained. Difficulties arise due to partial crumbling of the stock, when fast-curing stocks are compared to slow-curing stocks or when comparisons are made at different temperatures. In the latter case a correction factor for time lag to attain test temperature is necessary.

practical purposes it is well to use a temperature that does not result in too long a test time.

A complication enters, however, when tests are run at different temperatures. This is the result of the lag time in heating the relatively thick Mooney specimen to the test temperature. The lag time does not decrease with an increase in the test temperature, and it becomes a larger and larger proportion of test time as the latter decreases. Figure 4 shows a correction curve for this lag time plotted as effective time against elapsed time. This was constructed by integrating the curing effect during the heating part of the cycle in which it was assumed that cure rate doubles for an 18° F. increase in temperature. This curve was based on stocks containing about 50 phr of carbon black. Stocks with different thermal properties would be expected to behave differently. A gum stock, for example, would have a somewhat greater lag than is indicated by this curve. There may also be minor differences between different models of the viscometer and with different methods of heating.

An indication of the magnitude of this effect is shown in Table 3.

If, for example, one wishes to determine the temperature dependence of cure and scorch rate, it is essential that this correction be made. Figure 5 shows a plot of the effects produced by the addition of a series of retarders to a natural rubber stock accelerated with mercaptobenzothiazole or MBT. This figure is interesting not only in showing how well the corrected Mooney curve data fit on a plot of this kind, but also in showing the lack of basis for the oft-repeated claims that retarders are effective in reducing scorching tendencies at processing temperatures, but do not slow down the rate of cure at curing temperatures.

For our particular interest at the moment, it will be immediately apparent that in calculating the cure time using the suggested equation, an appreciable error would be introduced if one is comparing a pair of stocks, one of which cures quickly and the other slowly.

Calculation and Correlation with Stress-Strain

Equation 1, as described above, was based on a different convention for designating scorch time and on the use of the small rotor instead of the large rotor. The use of the small rotor gives a numerically smaller

TABLE 3. CORRECTION FOR LAG TIME

Test Temperature, °F.	t_5, Min.	t_5, Corrected, Min.	t_5, Min.	$t\triangle_{30}$, Corrected, Min.
240.....	33.8	30.5	7.4	7.4
260.....	16.0	12.7	3.6	3.6
280.....	8.4	5.17	2.12	2.05
300.....	5.27	2.53	1.25	1.02

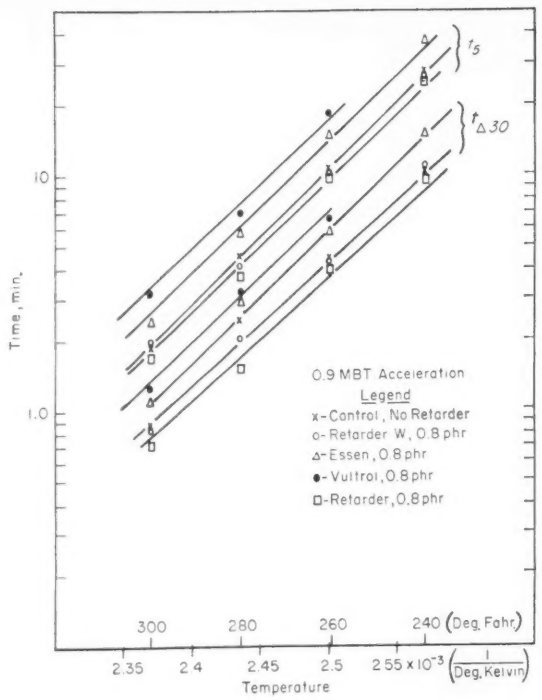


Fig. 5. Plot of Mooney cure data corrected for time lag showing effect of compounds with differing cure rates resulting from use of retarders

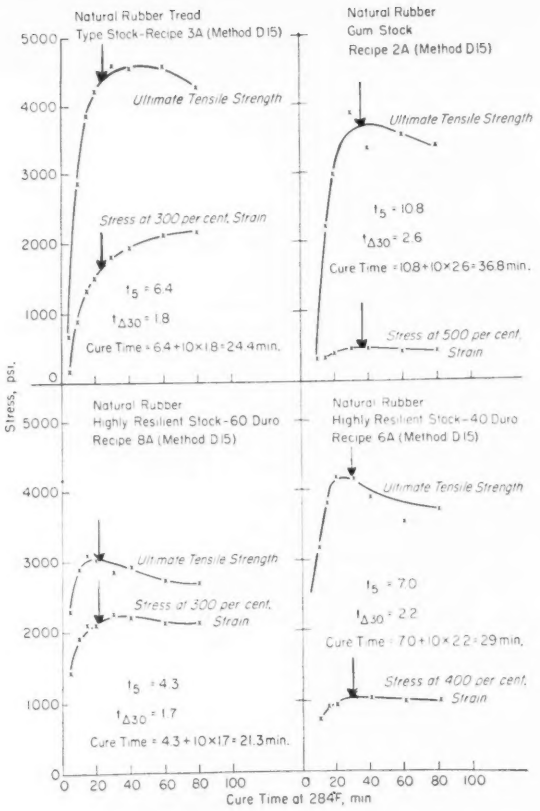

Natural Rubber Tread Type Stock-Recipe 3A (Method D15)
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 6.4
$t_{\Delta 30}$ = 1.8
Cure Time = 6.4+10×1.8=24.4 min.
Natural Rubber Gum Stock Recipe 2A (Method D15)
Ultimate Tensile Strength
t_5 = 10.8
$t_{\Delta 30}$ = 2.6
Cure Time = 10.8+10×2.6=36.8 min.
Stress at 500 per cent. Strain
Natural Rubber Highly Resilient Stock-60 Duro Recipe 8A (Method D15)
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 4.3
$t_{\Delta 30}$ = 1.7
Cure Time = 4.3+10×1.7=21.3 min.
Natural Rubber Highly Resilient Stock-40 Duro Recipe 6A (Method D15)
Ultimate Tensile Strength
t_5 = 7.0
$t_{\Delta 30}$ = 2.2
Cure Time = 7.0+10×2.2=29 min.
Stress at 400 per cent. Strain
Stress, psi.
0 1000 2000 3000 4000 5000
0 20 40 60 80 100
Cure Time at 284°F, min

Fig. 6. Results of tests on natural rubber showing relation between stress-strain data and Mooney cure test data

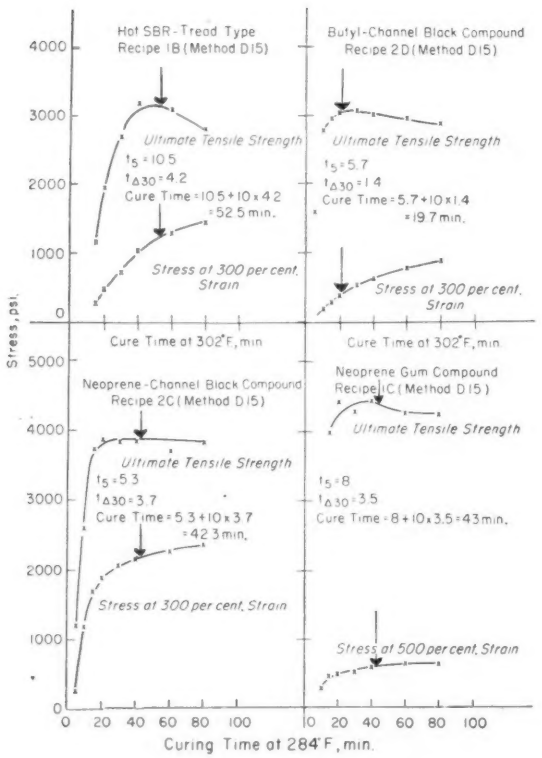

Hot SBR-Tread Type Recipe 1B (Method D15)
Ultimate Tensile Strength
t_5 = 10.5
$t_{\Delta 30}$ = 4.2
Cure Time = 10.5+10×4.2 = 52.5 min.
Stress at 300 per cent. Strain
Butyl-Channel Black Compound Recipe 2D (Method D15)
Ultimate Tensile Strength
t_5 = 5.7
$t_{\Delta 30}$ = 1.4
Cure Time = 5.7+10×1.4 = 19.7 min.
Stress at 300 per cent. Strain
Neoprene-Channel Black Compound Recipe 2C (Method D15)
Ultimate Tensile Strength
t_5 = 5.3
$t_{\Delta 30}$ = 3.7
Cure Time = 5.3+10×3.7 = 42.3 min.
Stress at 300 per cent. Strain
Neoprene Gum Compound Recipe 1C (Method D15)
Ultimate Tensile Strength
t_5 = 8
$t_{\Delta 30}$ = 3.5
Cure Time = 8+10×3.5 = 43 min.
Stress at 500 per cent. Strain
Stress, psi.
0 1000 2000 3000 4000 5000
0 20 40 60 80 100
Cure Time at 302°F, min
Curing Time at 284°F, min.

Fig. 7. Stress-strain, Mooney cure relation for SBR, butyl, and neoprene compounds

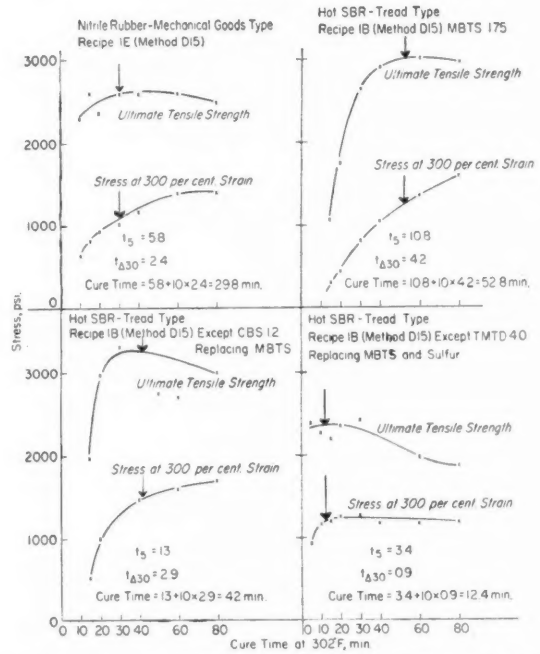

Nitrile Rubber-Mechanical Goods Type Recipe 1E (Method D15)
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 5.8
$t_{\Delta 30}$ = 2.4
Cure Time = 5.8+10×2.4=29.8 min.
Hot SBR-Tread Type Recipe 1B (Method D15) MBTS 1.75
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 10.8
$t_{\Delta 30}$ = 4.2
Cure Time = 10.8+10×4.2=52.8 min.
Hot SBR-Tread Type Recipe 1B (Method D15) Except CBS 1.2 Replacing MBTS
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 13
$t_{\Delta 30}$ = 2.9
Cure Time = 13+10×2.9=42 min.
Hot SBR-Tread Type Recipe 1B (Method D15) Except TMTD 4.0 Replacing MBTS and Sulfur
Ultimate Tensile Strength
Stress at 300 per cent. Strain
t_5 = 3.4
$t_{\Delta 30}$ = 0.9
Cure Time = 3.4+10×0.9=12.4 min.
Stress, psi.
0 1000 2000 3000
0 10 20 30 40 60 80
Cure Time at 302°F, min.

Fig. 8. Additional SBR compounds and a nitrile rubber compound confirming the correlation of stress-strain and Mooney cure data

viscosity value than the large rotor for the same material. The ratio is approximately 1.7, that is, the viscosity reading obtained with the small rotor multiplied by 1.7 will give the large-rotor value. Thus to obtain concordant results on the two rotors in a cure test, the scorch time for the small rotor should be taken at 3 units above the minimum instead of 5, and the rise beyond the scorch point should be 18 instead of 30. This ratio of large-rotor values to small-rotor values is not constant for all stocks and will vary slightly from one material to another owing to the different response of different materials to variations in the shear rate.

Because of these two points—the use of a different scorch point and the use of the large rotor (which we recommend for all except very stiff stocks)—Equation 1 has been modified to use a factor of 10 instead of 6.

These factors were selected on the basis that they fit, fairly well, the selection of optimum cure from stress-strain data considering both ultimate tensile strength and development of modulus. However, there is nothing absolute in these factors, and if one wishes, higher or lower values may be used.

As illustrations of how the calculated cure time from Mooney data corresponds to stress-strain data, a number of the formulations from ASTM Method D 15[8] were tested both in the Mooney cure test and by stress-strain. The results obtained are shown in Figures 6 through 8. On the basis of these data, which include stocks based on natural rubber, SBR, butyl rubber, and neoprene, the agreement between the calculated cure time and the cure one would select from stress-strain data is remarkably good.

In some cases one is dealing with a stock which is said to have an optimum cure based on some property other than stress-strain. In these cases the Mooney cure test can be used to judge the effects of compound variations by first determining what factor in the formula will give the accepted value for optimum cure. Thus if a stock is said to have an optimum cure of 40 minutes at 280° F. and one or more Mooney cure tests have been run on it, one can calculate a value for A as follows:

$$40 = t_5 + At_{\Delta 30} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

To recapitulate:

1. The large rotor should be used whenever possible.
2. A factor of 10 for the factor A will generally give good correlation with the selection of optimum cure from stress-strain *versus* time of cure, considering both tensile strength and modulus development.
3. For comparisons involving both fast- and slow-curing stocks or different temperatures, it is advisable to use the correction curve shown in Figure 4. The value of the factor A need not be changed.
4. If the value of 10 does not give good correlation with the selection of optimum cure, one can calculate a factor that will. This can be used for subsequent studies.

We have not studied in a systematic way all vulcanizing systems or all polymers. As far as we know, all that we have tried respond in the same way. If one varies the curing system in a single stock so that the cure rate is changed over a wide range, the calculated cure time will not give equal modulus. This result is because the state of cure will of necessity vary as well as the rate of cure. A possible explanation for the consistently good results obtained by this procedure is that the calculation gives a cure time at which a definite proportion of the curing effect has been exhausted.

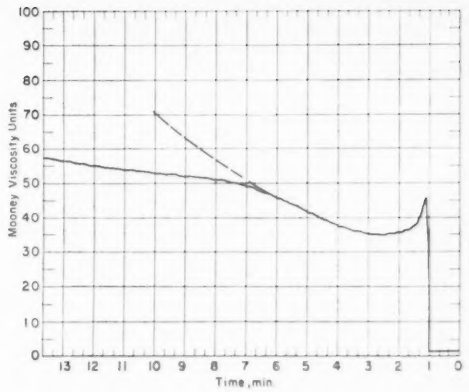


Fig 9. Irregular Mooney cure curve due to crumbling of stock

Possible Difficulties with the Method

One essential requirement of the method is that the viscometers on which the tests are run be maintained in good working condition. If this is not done, the results obtained will be unreliable. A prime requisite is that the machines be equipped with thermocouple junctions extending into the specimen so that the actual temperature of the stock (or of the cavity before the stock is inserted) is measured.

It is worth mentioning that as far as the cure characteristics are concerned, the machine need not be in calibration since it is only the shape of the curve that is of concern. Displacement up or down will not affect the values scaled from the curves. If one is using this method for control purposes, however, the value of the minimum viscosity is also of importance.

It should be obvious that any error in the determination of $t\Delta_{30}$ is multiplied by about 10 in making the calculation of curing time. Occasionally one will see a curve that rises irregularly. This is usually due to crumbling of the stock. In fact all such curves will eventually fall off because when the stock reaches a sufficiently high state of cure, it must, of necessity, tear. Figure 9 illustrates a curve in which this occurred at an early stage. When this tearing occurs, the portion of the curve beyond the point of irregularity should be ignored. Usually one can extrapolate the regular portion of the curve far enough to reach the point of 30 units above the scorch point. If this cannot be done, the test should be rejected and rerun.

To determine if the curve is irregular, one should have either a curve produced on a recorder or the actual

[8] "1958 Book of ASTM Standards," Part 9, p. 1225.

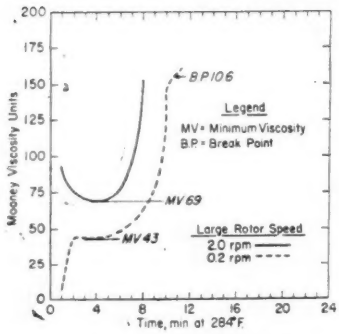
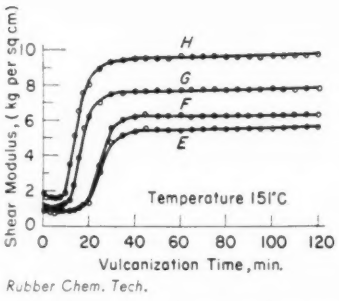
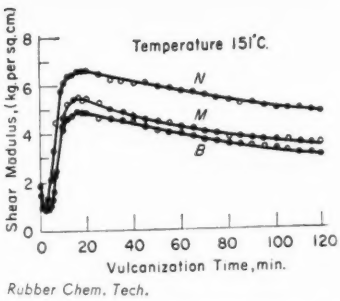


Fig. 10. Comparison of Mooney cure curves using rotor speeds of 2.0 rpm and 0.2 rpm



Rubber Chem. Tech.

Fig. 11. Complete cure curves for SBR stocks by Peter and Heidemann[9] method



Rubber Chem. Tech.

Fig. 12. Complete cure curves for natural rubber stocks by Peter and Heidemann[9] method which illustrate reversion

data taken by the operator, which should be plotted for inspection.

From what has been said, it should be apparent that the Mooney cure test covers only the beginning of the cure cycle. It ends at about the time the cure has reached the point where a measurable modulus is apparent. If it were not for the fact that the test is quite reproducible, this would be a serious weakness.

It was suggested that perhaps the time before crumbling occurs could be extended by operating the rotor at an appreciably slower rate. Tests run at 0.2 rpm. instead of 2 rpm. show that this can be accomplished. However, the time is extended only a little so that not much is gained. Figure 10 shows a pair of curves for a natural rubber tread-type recipe run at both 2 rpm. and 0.2 rpm.

A method of following the entire cure cycle was proposed very recently by workers in Germany.[9] This involves sandwiching a metal paddle between two flat specimens of the uncured rubber, the other surfaces of which are in contact with heating platens. The paddle is moved back and forth continuously at a frequency of 0.5 cps. and with an amplitude of 0.25 mm. The force required to do this is recorded and plotted as a function of the time of heating.

Figure 11 shows a series of curves of stocks based on SBR. *E* is an unloaded stock: *F* contains 50 phr of barytes; *G* contains 50 phr of a coarse black; and *H* has 50 phr of HAF black.

Figure 12 shows cure curves based on natural rubber which illustrate reversion. *B* is a stock containing 2.5 phr of sulfur and 50 phr of barytes; *M* contains 3.5 phr of sulfur; and *N* has 4.5 phr of sulfur.

Summary

The Mooney cure test is a sensitive and reproducible test for measuring the delayed-action portion of the cure and for measuring the rate of cure in the early part of the cure. From these data one can calculate an approximate optimum cure for a particular stock or equivalent cure times for different stocks.

Because the test involves only the early part of the cure period, it is necessary to exercise care in assuring that accurate measurements are obtained. The most common difficulty is that the viscosity curve in some cases exhibits an irregular rise due to partial crumbling of the stock.

In some instances, when fast-curing stocks are compared with slow-curing stocks or when tests are run at different temperatures, the correction for time lag in attaining the test temperature becomes important.

It would be desirable if the important feature of the Mooney cure test, a continuous measurement as cure progresses on a single specimen of stock at the curing temperature, could be extended to cover the entire curing range.

[9] J. Peter and W. Heidemann, *Rubber Chem. Tech.*, XXXI, 1, 105 (1958).

Plastic Polymers Described for SAE

The plastic areas of polymer applications were very completely covered for the Society of Automotive Engineers at its summer meeting, June 14-19, held at Chalfonte-Haddon Hall, Atlantic City, N. J. J. H. Du Bois, J. H. Du Bois Co., Cincinnati, O., presented a thorough and inclusive survey of 16 classes of thermoplastic and thermosetting resins in his talk on "The Expanding Polymer Horizon." Also included was some discussion on recent innovations and improvements in a number of important process and forming methods.

Mr. Du Bois indicated some applications where the automotive industry had used plastics, but included a list of potential uses replacing or augmenting some of the currently utilized materials which should indicate vastly expanded use of such polymers on cars.

A very valuable feature of this paper, particularly for the design engineer, is a table of properties chart covering 18 materials, which should make this paper an excellent reference source. The full text of the paper is contained in SAE preprint 82T.

Molding of Resilient Urethane Foams[1]

By R. E. KNOX and W. J. TOUHEY

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

W. J. Touhey

R. E. Knox

THE potential of resilient urethane foam for seating and upholstery applications, particularly in the furniture and automotive fields is well known and has been covered in detail in a number of published articles.[2] The advantages of this interesting class of materials may be summed up in two words—versatility and economy.

Generally, the problems encountered in the chemical tailoring of the urethane molecule to obtain foams with optimum physical properties have been largely solved. Urethane foam processing information, however, has been lacking, particularly where applications requiring molding or preforming are preferred.

The elastomers laboratory of the Du Pont company has investigated the variables which control this important unit operation. This study has shown foam molding to be a straightforward and reproducible process, provided control of a relatively few variables is exercised. This paper presents the findings of this work.

The object of the work was the preparation of molded resilient foam articles having properties equivalent to commercial standards for upholstery foams. These include: (1) a smooth surface free of gross imperfections, (2) uniform structure, (3) low density, for economic reasons, and (4) acceptable physical properties.

The process for the molding of resilient urethane foam is shown schematically in Figure 1. Controlled quantities of prepolymer and catalyst are intimately mixed and delivered to a mold where the foaming reaction takes place. The foam is allowed to gel and partially cure before being stripped from the mold.

The general foam formulation given in Table 1 was used in establishing the factors affecting preformed urethane foam molding. The table also shows typical physical properties of three of the foam modifications that have been molded. These foams differ from each other primarily in the composition of the prepolymer.

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[1] Presented before the Upper Midwest Section of Society of Plastic Engineers, Minneapolis, Minn., Oct. 8, 1957. Contribution No. 122 from the Du Pont elastomers laboratory.

[2] "Urethane Plastics—Polymers of Tomorrow." *Ind. Eng. Chem.*, 48, 1383 (1956).

R. G. Arnold, J. A. Nelson, J. J. Verbanc, "Organic Isocyanates —Versatile Chemical Intermediates." *J. Chem. Ed.*, 34, 158 (1957).

R. H. Walsh, "Automotive Engineering with Urethane Foams." RUBBER WORLD, 136, 386 (1957).

The Molding of Resilient Urethane Foams

This article covers the basic steps in continuous urethane foam production. It pinpoints the variables involved in this production and some ideas on their control. This report is the first on the continuing program at the Du Pont elastomers laboratory and is published at the request of many technologists who noted it as one of the references to the second report in the series which was printed in RUBBER WORLD in February, 1959. Although this work precedes that of the February paper, it had not been published. The editors of RUBBER WORLD are glad to fill this gap in urethane foam literature.

It is demonstrated in this paper that molding of urethane foam is quite successful if the enumerated variables are controlled. Continuous production of foamed articles can be done on an efficient basis by effective unit operations. All of the necessary engineering has been done and equipment is available for a continuous molding operation. It is a process that can be fitted with almost any automatic-type control from simple time or limit switches to a fully automated line. It can be used to make either preformed or postformed articles and is designed to make available the versatility and economy of these foams.

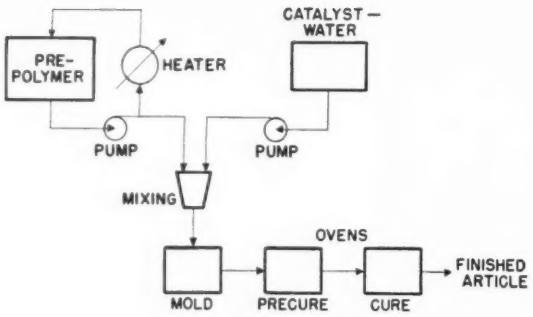

Fig. 1. Schematic foam molding manufacture flow sheet showing major steps in process

TABLE 1. TYPICAL RESILIENT FOAM FORMULATION AND SOME TYPICAL PHYSICAL PROPERTIES OF FOAMS FORMED BY VARYING THE GLYCOLS USED IN THE PREPOLYMER

Ingredient	Parts	
Prepolymer*	100.0	to give 9.5% free NCO
Hylene TM†		
Didecyl phthalate	5.0	
Silicone oil‡	0.5	
N-Methylmorpholine	1.0	
Triethylamine	0.3	
Water (120% theory)	2.5	

Physical Properties	Formulation A	B	C
Density, lbs./cu. ft.	2.42	2.55	2.6
Tensile strength, psi.	24.2	19.4	18.0
Elongation at break, %	414.0	279.0	220.0
Compression at 25% deflection, psi.	0.39	0.42	0.40
50% deflection, psi.	0.52	0.59	0.60
Set (SPI Method A), %	3.9	6.0	7.5
Resilience (ASTM Yerzley), %	47.7	47.8	51.0

* Polymers prepared from polyalkalene ether glycols and Hylene TM in the ratio of 75 parts of glycol to 25 parts Hylene TM.

† Toluene diisocyanate, Du Pont.

‡ DC-200, Dow Corning Corp., Midland, Mich.; L-45, Union Carbide Chemical Co., New York, N. Y.; SF-96 series, General Electric Co., Waterford, N. Y., 5-50 centistoke range.

Variables Controlling the Molding Process

The variables controlling the molding operation may be grouped into two main classifications. The first group deals with the variables encountered during mixing and delivery; the second, with mold filling. The mixing and delivery variables are mixing, delivery rate, temperature, and prepolymer viscosity. The mold loading variables are prepolymer viscosity, loading, distribution, mold venting, mold movement, and prepolymer, mold, and cure temperatures.

Mixing and Delivery Variables

The optimum physical properties of a given polyurethane foam are obtained when the components are homogeneously blended. The degree of mixing obtained depends on mixer design, power in-put, degree of hold-up in the mixing chamber, and prepolymer viscosity. Insufficient mixing results in density and cellular variations within the molded article. Too great a power in-put for a given prepolymer delivery rate will result in excessive temperature rise in the foaming mass, leading to variations in cell structure and, in extreme cases, complete foam collapse. The foams resulting from improper mixing generally exhibit objectionable variations in physical properties. From an operational viewpoint, over-heating should be avoided, since premature foaming in the mixing chamber may occur with resultant mixer plug-up.

A low hold-up type of urethane mixer is the most efficient for consecutive mold filling where rapid response to delivery and shut-off is required. Such mixers are characterized by close tolerances between rotor and mixing chamber. This characteristic requires that a proper balance be maintained between power in-put and delivery rate in order to prevent too great a residence time in the mixer, leading to prepolymer overheating. The maximum allowable temperature rise during mixing will vary, depending on the reactivity of the ingredients and the temperature at which they enter the mixer. Experience has shown that with current foam systems a temperature rise in excess of 3-5° F. is usually indicative of approaching mixer malfunction. Pictorial example of a mixer developed specifically for blending urethane foam components is shown in Figure 2.

As the prepolymer viscosity or the rate of delivery

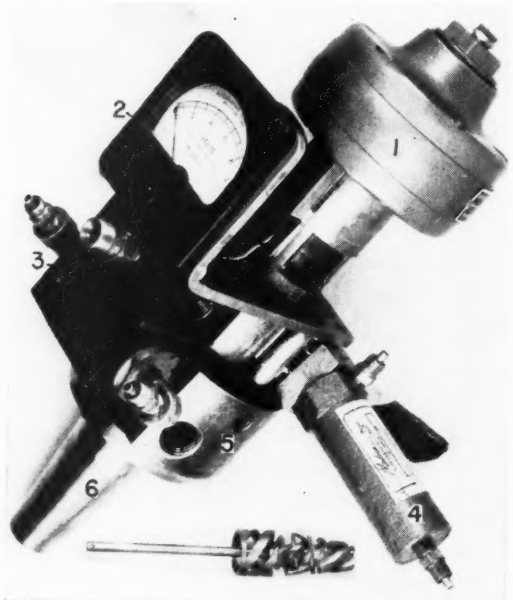

Fig. 2. Mixer for blending urethane foam components, (1) air motor, (2) tachometer, (3) four-way air valve, (4) air cylinder, (5) valve assembly, (6) mixing chamber, (inset) mixing blade showing basket section, mixing section, and discharge section from right to left

increases, the maintenance of a given degree of mixing may be readily accomplished by increasing the rotor speed. Each mixer, of course, is designed to operate within a given out-put range. A mixer of the type shown in Figure 2 has been used with prepolymers which varied in viscosity over a range of 1,500 to 80,000 cps. Delivery rates ranging from 2 to 20 lbs./-min. have been used, and the mixing speed has been varied from 1,000 to 8,000 rpm. A low-viscosity prepolymer is usually preferred, since pumping and metering are simplified.

Another important requirement during mixing is control of the rate of delivery of the feed streams. The ratio of prepolymer to a mixture of catalyst and water is usually of the order of 25 or 30 to 1. Control of this ratio is important, since the rate and extent of the foaming reaction are dependent on the amount of catalyst and water being used. The use of excessive catalyst-water mixture results in foams having coarse cell structure and variations in physical properties. Too little catalyst-water mixture results in an incomplete foam reaction, leading to soft, dense foam and generally inferior foam properties. For satisfactory foam production, the variation in the ratio of the prepolymer to catalyst-water mixture should be less than 1%.

Mold Filling Variables

Delivery of a properly metered and mixed foaming mass, while essential, is not a guarantee of a satisfactorily molded article. The foaming material must meet certain requirements during its placement and ultimate foam growth in the mold. Foremost of these requirements is that the foaming mass have the ability to flow while maintaining its stability. Foam systems are stable as long as the forces causing liquid drainage from the cellular walls are less than the forces causing the foam to persist. High viscosity impedes escape of gas and liquid drainage, contributing to foam stability. Initial prepolymer viscosity *per se*, however, is no criterion as to whether a foam will or will not collapse. Good resilient urethane foams have been made from prepolymers having initial viscosities ranging from 1,500 to 80,000 cps. Conversely, collapse has occurred in foam systems over this same range. The stability of resilient urethane foams is, among other things, dependent upon the rate at which the viscosity of the foaming mass is built up. The rate of viscosity build-up, due to chain extension and cross-linking, will vary, depending on the rate of the reaction and the initial prepolymer viscosity. Low initial viscosity prepolymers require a fast reaction and gelation rate; while a higher initial viscosity prepolymer will perform satisfactorily at a somewhat slower reaction and gelation rate. From a materials handling viewpoint, the ideal prepolymer formulation should have low initial viscosity, with a rapid reaction and gelation rate.

The amount of material placed into the mold must be accurately controlled, since a volume expansion of the order of 30fold occurs during foaming. If the mold

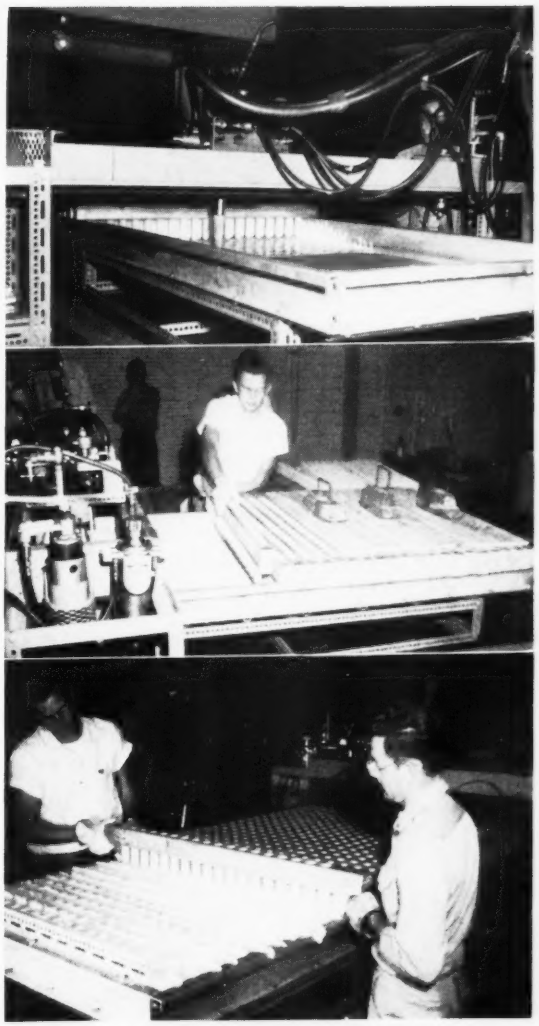

Fig. 3 *(top)*. Urethane foam mixture being poured into cored mattress mold

Fig. 4 *(center)*. Core sections being added before foam has time to rise

Fig. 5 *(bottom)*. Core sections being removed from the finished article

is underloaded, the finished article is incompletely formed. Too much material, giving either localized or general overloading, will lead to material loss due to trim, increased overall density, density variation between various portions of the article, and foam collapse. Loading variations of +5% to —1% have been found to be acceptable, in most cases. Actual practice has shown that mold loading can be controlled with an accuracy of ±0.3%. An important corollary to the quantity of material being delivered is its placement in the mold. Ideally, the foaming material should be placed in the mold in such a manner that horizontal movement is held to a minimum. Any necessary horizontal movement of the foaming mass should occur before gelation has proceeded to any appreciable ex-

tent. If foam movement occurs after gelation has proceeded too far, cellular shear can occur, leading to foam non-uniformity or collapse. Also, the amount of material being placed in the mold should have maximum distribution in a minimum of time. Additionally, the better the distribution, the lower the density of the resulting foam.

The distribution pattern used in filling a given mold will depend on the surface to volume ratio of the mold. The higher this ratio, the more critical the distribution becomes, and the more rapid must be the rate of fill. Although there are a number of ways in which acceptable mold filling may be achieved, experience has shown that a reciprocating-type mixer above a fixed or moving mold is a practical method. Experience with this type of equipment has indicated that with minor equipment modifications, it should be suitable for loading any type or size of mold.

A satisfactory mold must have provision for releasing not only displaced air, but also the small amount of carbon dioxide which escapes from the foaming mass. If this requirement is not met, excessive pressure will build up within the mold, resulting in increased foam density and, in severe cases, localized or general foam collapse. The maximum allowable pressure rise in the mold has not been determined. Zero pressure build-up, however, should be strived for.

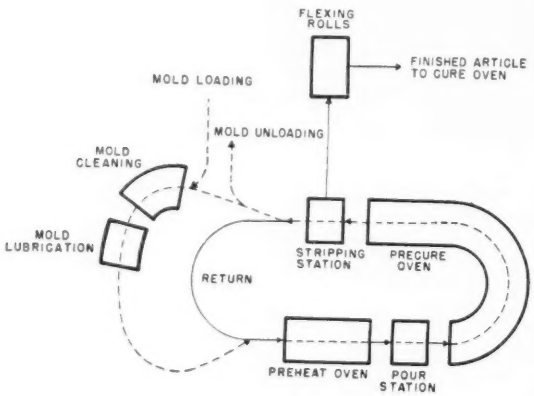

Fig. 6. Schematic drawing of a continuous molding line for the production of urethane foam articles

An additional requirement of the mold is that its surface be smooth and offer as little resistance to flow as possible. This requirement has been readily met by the use of mold release agents which serve a dual function of lubricating the mold surface and releasing the finished foam article.

After the foaming material has been distributed, rough handling or violent movement of the mold should be avoided until after the foaming mass has finished its expansion and has attained sufficient gel strength to withstand external shock. Otherwise collapse can result. A corollary to this fact is that when closed molds are used, the mold cover should be in position before the rising foam touches it. In the case of pin molding, the pins should be lowered into place before the rising foam touches them. This precaution is of particular importance when closed molds of high surface to volume ratios such as topper pad or mattress molds are used. One method of lid or pin placement which has been used with success is the sectional placing of pins in the mold as the foaming mass is being delivered, but before appreciable foam expansion has occurred. Pictorial examples of a section of slab foam being core molded and stripped are shown in Figures 3, 4, and 5.

Fig. 7. View of the semi-continuous urethane foam production unit used in this report

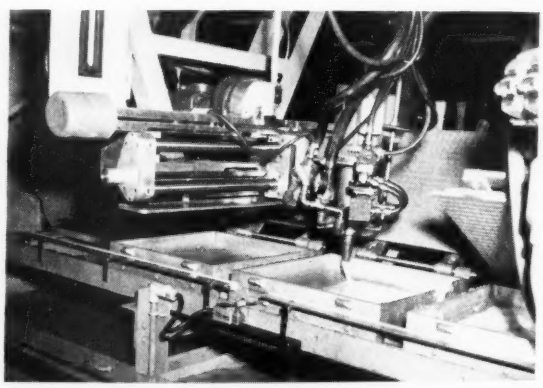

Fig. 8. Pouring station section of the unit showing the mixing head delivering foam prepolymer into the mold in continuous operation

Temperature of the molding system is important, since the rate of the foam reduction is a direct function of the temperature. If the mold surface is too hot, too rapid a reaction rate occurs at the foam surface. This can result not only in surface collapse, but also in low density just below the surface which, in turn, is associated with skin wrinkling. Temperature variations within the mold should be avoided. Uneven mold temperatures cause uneven rates of reaction which can lead to foam movement and surface collapse. Too cold a mold impedes the flow, which also causes surface collapse and increases the foam density.

As would be expected, there is a wide range of acceptable operating temperatures, the choice of which will depend on the foam formulation used, the density desired, and the maximum time allowable for stripping the finished article from the mold. Control of the pre-

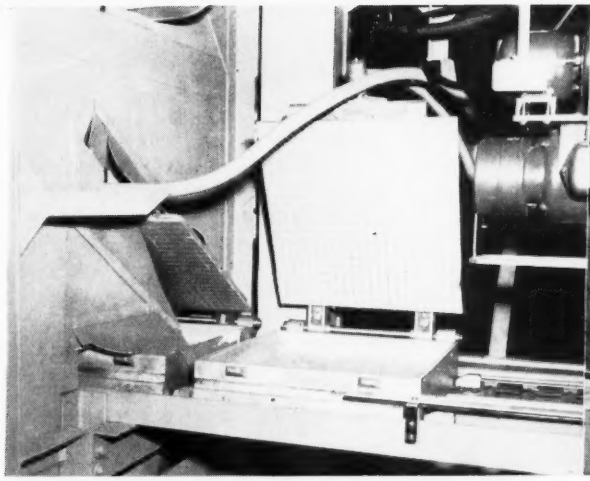

Fig. 9. Mold for producing solid cushion of urethane foam being fully opened automatically by cam rod

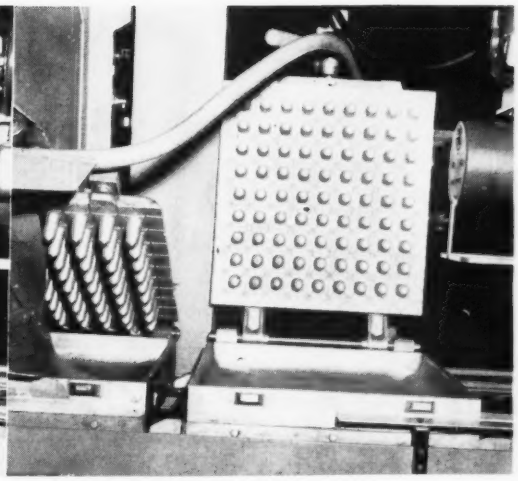

Fig. 10. Molds for cored cushions may also be run through this unit

polymer temperature is important because of its effect on the foaming reaction and density. Experience has shown that a ±1° F. control is desirable, since a 1% change in loading results for every °F. change in prepolymer temperature. The prepolymer temperature has been varied from 70 to 140° F. with 100 to 110° F. being the most commonly used. Mold temperature control is not as critical, with a ±3° F. variation being acceptable in most cases. The mold temperature has been varied from 75 to 250° F. However, the 120 to 190° F. range has been found to be most acceptable.

The defects encountered in molding, along with the causes of these defects, are coarse skin caused by foam movement, coarse glassy skin caused by high mold temperature, collapse under skin caused by foam movement, hard spots from uneven loading, soft coarse cells as a result of excessive catalyst, coarse cells caused by excessive NCO or high temperature, soft sticky foam due to too little catalyst, dense foam resulting from low NCO or low temperature, easily torn skin caused by cold mold, and knitting lines from a poor pour pattern.

The variables discussed in this paper may be called basic, since they will be encountered to some degree in any foaming system. To obtain a satisfactory molded article, it is apparent that these variables must be properly balanced. Changes in a given foam system, or a change from one foam system to another, will, of course, necessitate the experimental balancing of the variables in order to obtain optimum processing conditions.

Molding Equipment Requirements

The equipment required for continuous molding is shown schematically in Figure 6. These include raw material storage facilities and a metering and mixing unit not shown, and the mold preheat oven, mold-filling station, cure oven, a stripping station for removing the finished foam article, a continuous conveyor, a mold inventory, a control panel (not shown), flexing roll for breaking up foam cells to prevent shrinkage, and, finally, a postcure oven as indicated.

The elastomers laboratory has installed and evaluated a pilot molding line for the semi-continuous manufacture of urethane foam cushions. With the exception of a return conveyor, this line is similar to the schematic diagram given in Figure 6. The primary purpose of this equipment is to demonstrate that the continuous molding of resilient urethane foam is a practical unit operation.

The semi-continuous line, shown in Figure 7, 80 feet long, consists of a mold loading station, preheat oven, pour station, cure oven, and cushion stripping station. An endless chain conveyor moves the molds continuously from the loading to the stripping station, going through the ovens which are equipped with high-pressure steam coils and blowers to produce temperatures up to 250° F.

The pouring station, Figure 8, with fume exhausts at both top and bottom, is 10 feet long. The preheat and curing oven are each 28 feet in length and approximately 5½ feet high. The loading and stripping stations are each six feet long.

The molds, Figures 9 and 10, used for this line, are designed to allow production of either solid or cored cushions.

The conveyor speed is variable from 0 to 50 feet per minute. Maximum speed of the reciprocating mixer mechanism, Figure 8, is 3 ft./sec. Reversing the direction of travel of the mixer is effected by reversing the electrical field of the reciprocating motor which, in turn, brakes the motion and changes the direction. Both the reciprocating speed of the mixer and its distance of travel may be varied.

The prepolymer mixer is an electrically driven on-off mixer, the capacity of which may be varied from a minimum of 1,500 grams to a maximum of 8,000 grams per minute, with adjustments in the speed of the mixing blade. The on-off valve in the mixer is air-operated,

Fig. 11. Completed foam cushion is stripped from the mold in the final section of the experimental unit

but electrically actuated by a solenoid. After the valve has been opened for discharging the mixed material to the mold, the length of operation of the mixer is governed by the automatic timer which is adjustable within limits. Mixer height above the mold is adjustable to accommodate different-size molds.

The molds are opened and held opened through the preheat oven by a cam rail. This same rail fully opens the molds for passage through the filling station and closes them after filling. The molds are broken open after curing, by a short cam rail at the outlet end of the curing oven.

Continuity of molding has been demonstrated with this unit. Figure 11 shows the finished cushions being stripped from the mold.

Potential of Molding Urethane Foams

This development of the molding technique allows the manufacturer of urethane foams a choice between either preforming (molding) or postforming methods of fabrication. The choice between the two methods should be made on the basis of economy and end-product use.

A Look at the Future

Significant changes have occurred during the past few years in the polyurethane foam field, particularly in formulation and processing techniques. Because of these developments, increasing interest in new urethane foam applications is evident throughout the rubber, automotive, furniture, and aircraft industries. It is expected that this interest will increase and will lead to accelerated advances in this field in the coming years.

In the preforming of resilient urethane foams, the full potential of this unit operation will not be realized until line programming is undertaken. Molding line programming deals specifically with the satisfactory filling of randomly distributed, dimensionally varying molds. It involves the automatic presetting and control of the following variables prior to filling the mold: (1) mixer speed; (2) feed delivery; (3) mixer height; (4) reciprocation speed; (5) width of reciprocation; (6) conveyor speed.

The degree of automation may vary widely among foam producers and will, of course, be influenced by economic considerations. Programming may vary from the manual setting of predetermined conditions, to complete automation or card programming.

Summary and Conclusions

In summary, the variables which have an important bearing on satisfactory resilient foam molding have been determined. The simplicity of molding has been demonstrated, provided proper control of the variables is effected. Continuous molding has been shown to be an efficient, effective unit operation. The technology required for continuous molding is at hand. The equipment required for molding has been specified, and several equipment suppliers are now in a position to engineer completely the design, construction, and installation of such units.

•

Skeletal Urethane Foam Filters[1]

A new filter material has been developed for air-filtration uses such as air conditioners. This new material is a urethane foam prepared in such a way as to eliminate the normal membranes that cover many cells of conventional urethane foam. These foams have a three-dimensional structure of skeletal strands, which provides them with certain unique properties compared to other air-filter media.

With approximately 97% of its total volume being void area, the mesh-like structure provides enormous filtration capacity. In many cases this means that the urethane foam filter will hold more than twice its weight of dust before it impedes the air flow significantly. The filters can be used in the dry state or can be oil coated to provide somewhat higher arrestance efficiency.

Another important advantage of this new filter media is the ease with which it may be cleaned. It may be vacuum cleaned in place, or it may be removed from its framing and washed like toweling, wrung out, and dried for immediate reinstallation. It is resistant to all common detergents and cleansers. It does not mat down or separate to form open channels after repeated washings. It may be permanently mounted in place by being sewn, stapled, grommeted, or glued to other materials. It is most often used as a removable pad which may be cut to fit the framing involved. This removable and washable material will have a cost advantage in the long run, due to its long life, over throw-away filter elements that may have lower initial prices.

Currently urethane foam is being used in air conditioners as original equipment and replacement filters.

[1] Du Pont "Elastomers Notebook," June, 1959, p. 662.

Fundamental Control Techniques

II—Control Charts—Part 2a

By MASON E. WESCOTT

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WE SHALL now consider the nature, construction, and interpretation of the two leading members of the "attribute" family of control charts. These charts *must* be used to study certain types of quality characteristics, and they *may* be used very generally for almost *any* quality characteristic. The situation that makes their use appropriate is easy to recognize and may be characterized as follows: any inspection procedure that either *classifies* items as good or bad—acceptable or unacceptable—conforming or non-conforming, *or* which actually *counts* the number of defects found on a unit of inspection, but which makes no measurements directly, is an *attribute test,* and data gathered by such inspections lead to attribute charts.

Attribute Control Charts

Examples are legion. All tests conducted by use of go, no-go gaging equipment are attribute tests, because they do not *measure the degree of conformance;* they yield only a "yes" or "no" answer. For instance, in a drop-test for paper bags, a given bag either breaks or does not break when subjected to the test; there would be little useful information furnished by trying to *measure* how much of a break occurred. Likewise, all visual inspection tests are attribute tests. Thus, surface defects are either *seen* and *counted,* or not seen and passed—there is generally no attempt to *measure* the magnitude of each defect. The percentage of scrap in a day's production, the number of order-filling errors per 100 orders serviced, the number of mis-soldered connections per set in a radio assembly, the number of mis-picks or dropped threads per bolt of cloth, the number of breaks or weak spots in insulation per 1000 yards of insulated wire, the ratio of total rejections to total units inspected at final inspection per week, and so on, are further examples. You can (and should) think of additional examples from inspection procedures at your own plant that are attribute tests.

On the other hand, consider an electric fuse whose response time is to be checked. The inspection test

Attribute Control Charts

This installment continues Dr. Wescott's series on the fundamental control techniques used in quality control and concludes the information on control charts. In the May installment, measurement charts were discussed. In this installment attribute charts are covered. In contrast to measurement charts which are concerned with an actually measured value to produce control charts, these attribute charts are concerned with classifying items as good or bad or in counting and identifying defects without trying to measure any characteristics.

This is control applied to the go, no-go type of inspection. These charts consist of several types, but only two major types are discussed in this article. The first type discussed is the "fraction defective" or "p" chart, and the other is the "number of defects per unit" or "c" charts.

Attribute charts which can be expressed in percentages and thus are in familiar language for production personnel, are very useful in providing a visual record for the use of plant personnel. In fact, as Dr. Wescott points out, sometimes just the presence of an attribute control chart is enough to instill competitive action in the operators and cause improvements in the quality of the product, without any other direct action being taken.

These charts are also useful in keeping records of vendor quality on incoming raw materials and for keeping an overall quality picture on the entire plant or a department or area. These charts summarize quality history well and therefore can be used for reporting quality results to management.

The "c" charts are used in keeping records on the number of defects on a finished article (or articles) where the number of defects actually found is relatively small in relation to the number that could exist in the unit.

TABLE 1 - DATA SHEET FOR FRACTION DEFECTIVE CHART

PART NAME Side Panels PART NO. K30-L&R

OPERATION Enameling ASSEMBLY NO. K-30

INSP. STAT. 4 INSPECTOR MEW

Sample No.	Date & Time	Number Insptd n	Number Defeotive d	Fraction Defective p(%)	Defect Identification A	B	C	D	E	F	Notes
	4/4										
1	10 A.M.	200	12	6.0	3	3	1	4	0	2	
2	11	"	21	10.5	6	4	3	4	4	3	
3	2:30	"	9	4.5	5	0	3	2	0	2	
4	3:30	"	32	16.0	10	4	4	14	1	3	
5	4:30	"	24	12.0	8	4	0	11	0	3	
	4/7										
6	9 A.M.	"	10	5.0	4	3	0	3	0	0	
7	10	"	17	8.5	3	3	5	3	4	2	
8	11	"	7	3.5	2	0	1	1	1	2	
9	12	"	20	10.0	5	3	4	4	4	3	
10	1:30	"	0	0	-	-	-	-	-	-	
11	2:30	"	8	4.0	2	1	2	1	0	3	
12	3:30	"	3	1.5	0	0	3	0	0	0	
13	4:30	"	24	12.0	9	3	3	8	4	0	
	4/8										
14	9 A.M.	"	20	10.0	6	2	3	4	4	5	
15	10	"	19	9.5	3	3	4	3	4	4	
16	11	"	31	15.5	10	3	6	12	3	2	
17	12	"	14	7.0	2	4	2	3	0	4	
18	2	"	23	11.5	5	3	5	7	4	3	
19	3	"	16	8.0	8	0	0	8	0	0	
20	4	"	18	9.0	8	3	0	7	2	4	
Totals		4000	328		99	46	49	99	35	45	

could be either attribute or measurement. Thus, we might take each fuse in a sample from a given lot, subject it to a specified circuit test, and count the number that failed to blow within a given tolerance time under this test. If this number were too high, the lot sampled would be under suspicion and might be rejected. This practice would be testing on an attribute basis. Suppose, however, that we *measure* the time of blow under the specified circuit test for each sample fuse. This would be testing on a variable basis, and measurement ($\bar{X}$ and R) charts[1] rather than attribute charts would be appropriate for charting such data.

Thus there are quality situations where either attribute or measurement charts could be used, depending on the kind of information wanted and the nature of the inspection test. In general, attribute charts are simpler and less expensive to maintain than are measurement charts. They are also more flexible in that several different quality characteristics can be covered by a single chart; whereas each separate characteristic requires its own $\bar{X}$ and R chart. In exchange for these advantages, however, one loses some degree of sensitivity when an attribute chart is used *in place of* a measurement chart, because, quite clearly, an attribute chart cannot provide the detailed information about a quality characteristic that is available in an $\bar{X}$ and R chart. For example, we know more about the characteristic "time-of-blow" for fuses when we *measure* it than we do when we set a *fixed* time limit and merely *count* the number of fuses that conform or fail to conform to this time tolerance.

With these rather general notions as an introduction to the surname "attribute" charts, let us consider them in order by their Christian names. The only two members of this family we shall consider are: (1) "fraction defective," or "p" charts, and (2) "number of defects per unit," or "c" charts.

[1] RUBBER WORLD, May, 1959, p. 252.

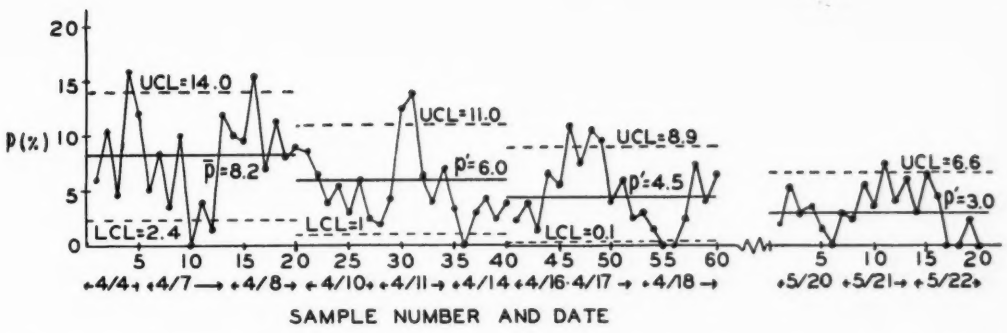


Fig. 1. The fraction defective or "p" attribute chart for the enameling operation used as illustration in the text

1. The Fraction Defective, or p Chart

GETTING THE DATA. Consider an enameling process where the product is given a 100% visual inspection before going to assembly. Suppose there are six major defects, the occurrence of any one of which on the piece inspected will render it classifiable as a defective and prevent its going on to assembly. Suppose that about 1,500-1,600 pieces pass through the inspection station every eight hour day. How shall we record inspection data for this product and use these data to keep a control chart that will show the variation in, and general level of, the proportion of production rejected at this station?

Table 1 shows a record form that would be useful for the purposes mentioned. In practice, the defect columns headed A through F would show the actual defect by name rather than by letter designation. Record forms for p chart data are easy to devise. The particular headings and column arrangement, and the amount and nature of accessory information to be accommodated, can be readily adjusted to suit the special needs of the problem under study. The essentials that every such form *must* have are: (1) sample identification by number and *time*, (2) number of units inspected in each sample, (3) number of units in each sample found to be defective for any or all reasons, and (4) the ratio, for each sample, of item (3) to item (2). The form shown in Table 1 provides these essentials, and, since rejection of a given piece can be made for more than one defect, provision is made also for checking the reasons for rejection. Thus it will be easier to track down sources of trouble responsible for poor quality. We need a minimum of 10 samples to make a chart; our record sheet gives data for 20 samples.

Note that each sample size here is 200. Since this is a 100% inspection situation, the results have to be subgrouped in some manner for control chart purposes. With daily production about 1,500-1,600, a sample size of 200 will furnish about one point an hour on the chart. After each 200th inspection, the inspector merely begins entering rejections on the next sample line.

The question of sample size for p chart work is of key importance. In the first place, it is not always possible to maintain a constant sample size. Thus, if we were to take daily production as sample size in our example, we would have samples of varying size from day to day, and only one point per day on the chart.

In the second place, when a choice is possible, sample size should be chosen in some relation to the expected average quality level. Thus, if the quality level is as good as ½% defective on the average, we would need a sample size of at least 200 to give any defectives a decent chance to show up in the samples. On the other hand, if the quality level were as bad as 15% defective, we could get useful data with as small a sample size as 10. For a p chart to be an effective control tool, we need samples that can be expected to contain some defectives. It is the old story of not being able to get something from nothing: if sample size is too small relative to quality, not enough defectives are picked up to give a good reflection of process variability with respect to the attribute being tested. If sample size is too large, relative to the quality level, we should probably be doing more inspection than is necessary for the maintenance of an adequate p chart. There are no sharp criteria for deciding when a sample size is "large" or "small," or when quality is "high" or "poor," but the general principle is: relatively large subgroup size for sampling product of high quality; relatively small subgroups for sampling product of poor quality.

There is a good discussion of this whole question of sample size for attribute charts, as well as a readable and thorough presentation of the entire topic of p charts, in Chapter X of Grant[2] and Chapter 9 of Burr.[3]

MAKING THE CHART. Turning our attention now to the construction of the chart, let us note first that the variable which is plotted on a fraction defective chart is the ratio p, defined, as one would expect, by

$$p = \frac{\text{no. of defective units found in the subgroup inspected}}{\text{total no. of units in the subgroup inspected}} = \frac{d}{n}$$

This definition implies that the chart will require a horizontal sample identification scale (numbered from zero through 20 for our data) and a vertical axis scaled as a pure number in some suitable unit to accommodate the p values to be plotted. Values of p may, of course, be plotted either as decimal numbers between zero and one, or as percentages. The latter plan is favored in most shop applications, and is the one we shall follow. For our data, the p axis is scaled from zero through 18.

[2] "Statistical Quality Control," E. L. Grant. McGraw-Hill Book Co., Inc., New York (1952).
[3] "Engineering Statistics and Quality Control," I. W. Burr. McGraw-Hill (1953).

These values are plotted as the first 20 points in Figure 1. We now proceed to supply a central line and control limits.

The central line, or average fraction defective, designated by $\bar{p}$, is defined as follows:

$$\bar{p} = \frac{\text{total no. of defectives found in ALL subgroups inspected}}{\text{total number of units in ALL subgroups inspected}} = \frac{\Sigma d}{\Sigma n}$$

This definition will yield the correct value of $\bar{p}$ regardless of whether sample size varies or remains constant. For our data we have, from Figure 1, $\bar{p} = (328)/(4000) = 0.082 = 8.2\%$. We plot this as a solid line on the chart.

It is clear from Figure 1, and from what has just been said, that the fraction defective, p, in these 20 samples *varied*, and that it varied about an average level of $\bar{p} = 8.2\%$. It must therefore follow that there should be some way to describe this variation numerically, and, in particular, there should be some criterion or yardstick for deciding whether or not the variation in p is consistent with its expected (average) value, $\bar{p}$. Mathematical theory (which, curiously enough, originated with the study of certain gambling problems more than 200 years ago!) supplies the yardstick we need here, and, as you may have guessed, it is the standard deviation of p, denoted by σ_p. The control limits on a p chart are then placed at $3\sigma_p$ from the central line $\bar{p}$. Points on a p chart may vary *within* these limits by chance only, but points outside these limits are not consistent with the average, $\bar{p}$. Their presence *outside* the limits justifies the contention that they got out there as a result of some assignable cause (or causes) not natural to a process operating at a level of $\bar{p}$.

But how do we calculate σ_p? For a series of p values *all based on the same sample size*, n, the formula is

$$\sigma_p = \sqrt{\bar{p}(1-\bar{p})/n}.$$

Consequently, using UCL_p for "upper control limit on p," and LCL_p for "lower control limit on p," we have

$$UCL_p = \bar{p} + 3\sqrt{\bar{p}(1-\bar{p})/n}$$
$$LCL_p = \bar{p} - 3\sqrt{\bar{p}(1-\bar{p})/n}.$$

For our data we find $UCL_p = 14.0\%$ and $LCL_p = 2.4\%$. These are plotted as broken lines on the chart. Table 2 summarizes the formulas and calculations we have been discussing, and the first panel of Figure 1 shows the completed chart for the data of Table 1.

INTERPRETING THE CHART. The first chart in Figure 1 shows the process operating at a level of $\bar{p} = 8.2\%$, and out of control at this level. Sample #4 and sample #16 show too high a % defective, and samples 10 and 12 show too low a % defective to be accounted for as chance variations for a process supposed to average 8.2% defective. Looking at the Table 1 defect record, we note that defects A and D predominate, not only at samples 4 and 16, but as totals for all 20 samples. Investigation and corrective action to improve these two components of quality should help to establish control, and to do so at a level lower than 8.2%. It might even be a good idea to keep a separate chart for a time on each of the sources in the process contributing to defects of type A and D. Frequently the only clue given by a p chart as to the *cause* of trouble is the record of *when* the trouble occurred.

TABLE 2. ANALYSIS OF DATA FOR P CHART

$$\bar{p} = \frac{\text{total no. defective}}{\text{total no. inspected}} = \frac{328}{4000} = 0.082 = 8.2\%$$

$$\sqrt{\frac{(\bar{p}1-\bar{p})}{n}} = \sqrt{\frac{(0.082)(0.918)}{200}} = \sqrt{0.00037638} = 0.0194$$

$$UCL_p = \bar{p} + 3\sqrt{\bar{p}(1-\bar{p})/n} = 0.082 + 3(0.0194)$$
$$UCL_p = 0.082 + 0.058 = 0.140 = 14.0\%$$
$$LCL_p = \bar{p} - 3\sqrt{\bar{p}(1-\bar{p})/n} = 0.082 - 0.058$$
$$= 0.024 = 2.4\%$$

Points below the lower control limit on a p chart deserve just as careful study as do those that are out on the high side. Such points, when investigated, may lead to the discovery of some source of improvement that can be permanently worked into the process. They may also be an indication of faulty inspection procedures, or relaxation of inspection standards, which need to be corrected. It may take some persuasion to convince operating personnel that a process is "out of control" when a sample point shows quality *apparently* so much better than average that it plots below the lower control limit! Nevertheless, it is always wise to investigate such points for the reasons mentioned.

There is, of course, no range chart associated with attribute charts. On these charts, process variability, or spread, depends upon process average, e.g., on a p chart σ_p is defined in terms of $\bar{p}$. It follows that, for a fixed sample size, n, the lower the process average, $\bar{p}$, the less spread or variability there will be in fraction defective from sample to sample in a controlled process. There are thus two "controls" on an attribute chart: (1) the level ($\bar{p}$ for a p chart), which we want to be as low as is economically feasible, and (2) the spread (UCL_p — LCL_p, or $\bar{p} \pm 3\sigma_p$, on a p chart), within which we want all, or nearly all, process variability to fall if we are to have a process that is operating in control, i.e., in a predictable, consistent manner. For the enameling process, it seems unlikely that a level of 8.2% defective is as good as would be economically feasible, and even if it were, we would want the process to operate more consistently with respect to this level than it did over the 20 samples charted in Figure 1. Thus, there is a clear challenge in this chart to go to work on the process and improve its performance.

ADOPTION AND USE OF STANDARD VALUES. How about *control* versus satisfactory control with an attribute chart, in particular, a p chart? A process is operating in satisfactory control with respect to fraction defective when (1) the level, $\bar{p}$, is as low as is economically feasible, and (2) the process operates in control at this level. Since there are generally no objec-

tive criteria (such as blueprint specifications) for attribute charts, the level to be considered satisfactory must be set in terms of the best performance the process is capable of delivering for the money we can afford to spend on it. Maybe we could get the process to operate at a level very near zero if we spent enough time and money on it. But unless the expense of such refinement were justifiable, it would be better business judgment to accept control at some higher level.

Suppose it is decided for our enameling example that 3% defective would be a level at which the process could be operated very profitably if we could get and hold it down to this level without too much expense. If it turns out that the process can do better than this, then that will be just so much velvet, but we are willing to settle for 3%. Control limits, for a sample size of 200, will then be $UCL_p = 6.6\%$ and $LCL_p = 0$. How shall we arrive at this happy state?

There is an old saying that if you have to eat an elephant, the best way to go at it is one bite at a time! Our plan (and that which has been successful in many applications) will be to adopt a *trial standard* for the next 20 samples, set up a blank chart based on this standard, and see what happens as we go to work to improve the process. But we will not try to get all the way down from 8.2% to 3% in one jump! If we assume that samples 4 and 16 are due to assignable causes which we can find and remove, we can argue that the $\bar{p}$ for the other 18 samples will be $(265)/(3600) = 0.0736 = 7.36\%$. But the assignable causes responsible for samples 4 and 16 must also have some effect on the other samples; so 7.36% is still higher than we can expect after corrective action has been taken on these causes. Let's be conservative and aim for 6%. The symbol p' is used for a standard value; $\bar{p}$ is reserved for an actual *computed* value based on process data. With sample size $n = 200$, we then have $p' = 6\%$, $UCL_p = 11.0\%$, and $LCL_p = 1.0\%$.

These lines (or at least the central line $p' = 6\%$) are then posted on the chart, *which we keep where operating personnel can see it,* and we watch the returns come in, posting on the chart each sample point as its value is determined by the inspection results. If you want to see some fun, try this out in your plant on some process where you feel sure improvement can be made, and where the operating personnel are willing to go along with you on the use of this new "gadget." A p chart makes sense to most shop people—they are used to thinking in terms of percentages. If you feel the control limits are going to present a hazard, keep them to yourself in your little black book for a discreet period of time and leave them off the chart in the shop. Human nature being what it is, if you choose a standard, p', that can be met or bettered, you will be in a position to capitalize on a powerful natural instinct: the competitive spirit. If you deserve and have the confidence of operating personnel, set up a reasonable standard, p', as a bogey, and watch them whittle it down for you! There are many actual cases on record where the mere *presence* of a p chart in an operating area has brought quality improvement *without any other action* having been taken!

The next panel (Samples 21-40) in Figure 1 shows what happened in our enameling process. We were too conservative. Corrective action on the process and the cooperation of operating personnel actually brought the level down to a process value $\bar{p} = 5.2\%$, although we have not yet succeeded in establishing control. But a 37% reduction in process level in one jump is a real improvement. It turns out that defect type C was responsible for both of the high points at samples 30 and 31; no explanation was found for the low point at sample 36.

Now shoot for $p' = 4.5\%$, which will give control limits at $UCL_p = 8.9\%$ and $LCL_p = 0.1\%$.

Samples 41-60 on Figure 1 show what happened during the next run of 20 samples. We did not quite make the $p' = 4.5\%$ goal; the process value here was $\bar{p} = 4.8\%$. Samples 46, 48, and 49 show that there are still some "bugs" in the process. But there are two zero points on this run, and with an LCL_p of 0.1%, $p = 0$ can scarcely be regarded as an out-of-control value. Even so, it would be wise to look into these two zero points. Maybe the law of diminishing returns is beginning to operate here; maybe a goal of $p' = 3\%$ is too expensive to try to reach. On the other hand, this process has been under the stimulus of control chart operation for less than two weeks. In that time we have skimmed the cream off the job; we have pretty well licked all the *easy* problems! Now is the time to roll up our sleeves and really go to work on this process, bringing to bear on the problem all the imagination, initiative, and good, solid engineering effort consistent with reasonable costs. Maybe we can still squeeze some more improvement into the process!

The last panel of Figure 1 shows the ultimate triumph. After further work and experience under control chart operation, the sights have been set at $p' = 3\%$, and for these 20 samples the process has actually averaged $\bar{p} = 3.2\%$ with just one point outside the control limit. A fraction defective of 7.5% would have been considered better than average ($\bar{p} = 8.2\%$) to start with, but the laws of probability say very emphatically that a fraction defective of 7.5% from a process supposed to average 3.2% is just as unlikely a variation as 14.9% would be for a process operating at an average of 8.2%. Variations in p have to be considered against the background of the cause system from which they came, and the laws of probability guarantee that a system for which $\bar{p} = 3.2\%$ is a very different system from one for which $\bar{p} = 8.2\%$, sample size being the same in both cases. With the process, however, operating as close to the desired level of 3% as this one is, we shall not be too unhappy if occasionally a point goes over the control limit.

Neither shall we accept it complacently! Our job now is to keep the goal set at $p' = 3\%$ and *keep the process in control at this level.* If we keep our guard up, follow through on every evidence of deteriorating quality, such as a run of 7 or more points all on the high side of the center line, or one or more points outside the UCL_p, and continue to make appropriate corrective action as occasion requires, it is not at all unlikely that in time we may succeed in working this process down

to a level even closer to zero than 3%. It has happened just this way in many actual applications. But if 3% is an *acceptable* level, we shall concentrate our efforts on maintaining control at a level no worse than 3%, regarding any further *improvement* as a dividend on this investment.

Summarizing this section on standard values for attribute charts, we note the following points:

(1) Make a chart based on *process values* for an adequate number of samples (preferably 20 to 30), getting the data either from past inspection records or current production.
(2) Study the *chart* and the process, and either make further trial-run charts based on process values, or adopt a trial standard, and see if the process can be made to equal or better this standard. If you set a standard at an early stage in control operation, be sure you set it high enough on the chart so that there is a good chance of beating it on the next run.
(3) Keep working on the *process*. Remember the chart does not *improve* quality, it only *reflects* quality. The chart can help very much, but the actual improvement in quality comes in the process rather than the chart.
(4) Ultimately you will be able to discover the optimum level at which the process can be operated consistent with the quality desired and the money that can be spent to get this kind of quality.
(5) See that the chart is *used* to maintain control at the optimum level. This means taking corrective action whenever it is called for. It also means reviewing the standard periodically and revising it if necessary to keep the chart consistent with process capabilities should further improvement take place.

OTHER USES OF p CHARTS. It is not to be inferred that p charts are restricted to process control. They are a versatile form of control chart; hence they have a wide range of usefulness. In particular, they are valuable adjuncts of acceptance sampling at incoming inspection. They furnish a simple, graphic record of a vendor's quality level on submitted material, and they tell whether or not he is operating in control at this level. They are excellent charts for giving an overall quality picture for a whole department or area of operation in a plant. Because they have the ability to summarize quality history in terms of percentage, p charts are a "natural" for reporting quality results to management. In fact, the p chart has often been called a "management chart."

(To be continued)

Moisture Meter Made in Russia

AN INSTRUMENT for the determination of moisture in rubber products has been developed by a team of researchers in the USSR. It is described in a paper, "Determination of the Moisture Content of the Carcass of a Tire Using an Electric Hygrometer" by E. G. Vostroknutov, N. M. Bodak, and A. F. Smirnov.[1]

The work was undertaken because of the importance of the moisture content of the tire in repair work when the new tread rubber is applied. It is desirable to have some moisture in the carcass so the common practice of drying all tires at 60° C. for 48 hours has the disadvantage of producing "overdried" carcasses. At the same time, some of these carcasses are sufficiently dry upon arrival at the repair line; thus the 48-hour dry period is a complete waste of time and money.

The development of a suitable device for measuring this moisture had to take into account several very important factors. The moisture would not necessarily be uniformly distributed throughout the carcass; so the device must be capable of making several quick checks at a number of points around the carcass and also be able to pinpoint local areas near defects where moisture may collect to a greater degree. The device must also be such that it can make determinations before drying and also during the drying operation, and it must be rapid, portable, and reliable.

The principle on which the development of the instrument is based comes from work done before in other fields. This principle depends upon the fact that a higher moisture content lowers the electrical resistance and *vice versa*.

In the case of tire carcasses it was found that the moisture content of the tire cords must also be taken into consideration, and that the reading obtained is a combined reading of the moisture content of rubber and the cord. The correlation of megohms readings to moisture content is made on this basis.

The paper contains a detailed description of the experimental procedure used to check this new device with accepted weighing methods. The instrument itself is quite simple, shaped somewhat like a pistol with the two needles at the barrel end and the leads to the resistance meter from the bottom of the grip. It was not found necessary to standardize the two needles as to size, shape, or distance apart, but only to design them so as to be thin enough for easy insertion and short enough so that they will not break.

[1] *Kauchuk i Rezina*, No. 1, Vol. 18, Jan., 1959, p. 43, as translated by RABRM in *Soviet Rubber Technology*, No. 1, June, 1959, p. 41.

MEETINGS and REPORTS

ASTM D-11 and Tech-A Meet at Atlantic City

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials met as a part of the annual meeting of the Society at the Chalfonte-Haddon Hall Hotels in Atlantic City, N. J., during the week of June 22. D-11 subcommittees met on June 23 through 25, and the main committee on June 26. The meeting of D-11 and its subcommittees was preceded by meetings of sections of the SAE-ASTM Technical Committee on Automotive Rubber, and the meeting of Tech-A itself was held on June 24.

On June 23 the Society's Marburg Lecture was given by Herman F. Mark, Polytechnic Institute of Brooklyn, on "New Polymers—New Problems."

A joint meeting of Committee D-11 and Committee D-20 on Plastics was held on June 25, at which time technical papers on "Improved Oven Design for Accelerated Aging of Polyvinyl Chloride," by Markus Royen, Apex Tire & Rubber Co., and "The Effect of Die Closure Pressure on Mooney Viscosity Determinations," by N. N. Mueller, of the elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., were presented.

The usual dinner of Committee D-11 was held on the evening of June 25 and was attended by members of Tech-A also.

Among those receiving ASTM's Award of Merit at this meeting of the Society was E. G. Kimmich, chief engineer, industrial products development division, Goodyear Tire & Rubber Co., and an active member of Committee D-11 for many years. The Award was given in recognition of outstanding and sustained service in ASTM technical work and for services in Cleveland ASTM District Council affairs. Mr. Kimmich is active also in the work of the joint Tech-A committee. He has served as chairman of numerous subcommittees and sections on belting, hose, and other mechanical rubber goods for both Committee D-11 and Tech-A.

Committee D-11 Meeting

The meeting of Committee D-11 was held on June 26 with Simon Collier, Johns-Manville Corp., chairman, presiding and assisted by John J. Allen, Firestone Industrial Products Co., secretary.

It was reported that there had been quite a few recent changes in the membership of Committee D-11 and that 12 new companies and/or members had been added. Contributions of members to the D-11 fund have provided a balance of $1,779 for committee projects.

It was announced that a research recording committee will be formed for the purpose of reviewing new projects before their initiation in order to avoid duplication or repetition of effort.

A new issue of "ASTM Standards on Rubber Products" will be published in November of this year and will include for the first time a subject index.

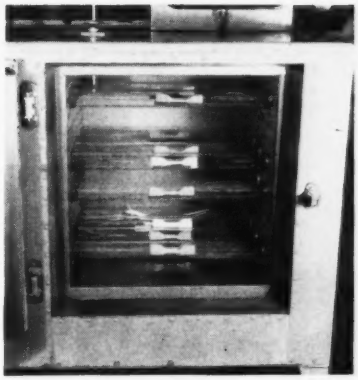
E. F. Webster has replaced F. M. Galloway, both of the Quaker Rubber Division, H. K. Porter Co., as chairman of subcommittee 2 on belting, and L. G. Mason, B. F. Goodrich Co., has replaced N. Bekkedahl, National Bureau of Standards, as chairman of subcommittee 12 on natural rubber.

R. D. Stiehler, NBS, reported that the eighth meeting of ISO/TC 45 is scheduled for the week of October 26 at the Henry Hudson Hotel in New York, N. Y. Members of the American Group for ISO/TC 45 will receive copies of the official program for this meeting in the near future.

The next meeting of D-11 will be held as part of ASTM Committee Week at the Hotel Sherman in Chicago, Ill., beginning on February 1, 1960. D-11 and its subcommittees will meet on Wednesday, Thursday, and Friday of that week. There will be a papers program as a part of the D-11 meeting.

Marburg Lecture

Herman F. Mark, director, Polymer Research Institute, Polytechnic Institute of Brooklyn, Brooklyn, N. Y., delivered the annual Marburg Lecture entitled, "New Polymers—New Problems," on June 23. This lecture is a memorial to the first secretary of ASTM and was established to emphasize the importance of furthering the knowledge of properties and testing of engineering materials.



Apex tubular oven showing replacement walls, glass tubes, and specimens in holders in tubes

Dr. Mark first reviewed the strength and hardness properties of metals and high polymeric materials and then pointed out the need of means of improving the time-tensile strength-elongation effects of many high polymers. He described and illustrated the value of orientation of high polymer molecules in improving the strength of these materials. He added that unregulated non-stereospecific polymerization was the price paid during the last decade for producing usable polymers quickly and cheaply.

During the last few years new catalytic systems (Ziegler and Natta) have been discovered, and new methods of polymerization have been developed which permit the preparation of many organic polymers with a much higher degree of molecular regularity than has been possible hitherto, it was said. Some of these new materials have already found interesting and meaningful applications; while others are just now being investigated in respect to their most profitable and promising uses. But besides their immediate or pending practical applicability, these highly ordered macromolecules have also posed new fundamental questions of nomenclature, classification, and characterization. They force us to widen our scope and to expand the basic framework of polymer science in order to permit an adequate description and interpretation of all the data assembled within the last few years, Dr. Mark added.

Large molecules, regular, but rigid chains are required for high strength, heat resistance, etc. The new techniques of polymerization are narrowing the gap between metals and plastics, and the properties of some of the latter are now approaching those of some of the former.

Oven Aging and Mooney Viscosity

"A Study of the Accelerated Aging of Vinyl Compounds in a Modified Testing Oven," by Markus Royen, Apex Tire & Rubber Co., was the first paper given before the joint meeting of committees D-11 and D-20 on the morning of June 25. Because of Dr. Royen's absence from the country, the paper was presented by A. E. Polson, of the same company.

It was stated at the outset that when the work reported in this paper was begun several years ago, no practical method was available for the reproducible heat age testing of vinyl compounds. This situation continues since for the past year an ASTM D-11 and D-20 task group studying the oven aging of plasticized polyvinyl chloride and highly plasticized elastomers recently concluded that the present oven aging procedure is not satisfactory.

The work at Apex Tire has become a part of the study of the abovementioned task group in that this paper is a preliminary report or introduction to a method scheduled for further study. The work reported extends over several years and was described in four specific phases as follows: (1) an investigation of uniformity of heat aging vinyl compounds in present ovens with present methods; (2) a description of a practical modification of the conventional heat aging oven; (3) an investigation of the uniformity of heat aging vinyl compounds with this oven; (4) the determination of duplicability of results from several ovens so modified.

In the work reported for the first phase it was shown that three vinyl electrical insulation compounds aged by ASTM methods in three different laboratories showed no corroboration, that aging severity, as measured by elongation retention and weight loss for one of the three compounds, increased with air flow in the oven, that there is substantial variation in aging within the row of samples in the oven, with the greatest severity encountered at the air inlet side, that the deviations within each row are great and appear to increase near the oven center for rows of samples parallel to air flow, and that for samples perpendicular to air flow there is a definite pattern of increasing degradation as row position approaches the air inlet.

The objectives which governed Apex Tire's work on oven modification were stated as uniform air flow over the sample with minimum turbulence, simple adjustment of temperature and air flow conditions, sample isolation to eliminate contamination, and practical and economical adaptation of existing equipment. The Apex tubular oven conversion unit shown in the accompanying illustration has achieved these objectives. The unit consists of two replacement walls of heavy-gage, rigid aluminum sheets provided with machined holes and attached clips to

Portrait by Roberts

A. E. Polson

accommodate the sample tubes. The air entrance wall is provided with vents for each tube position which may be individually adjusted from within the oven for a predetermined setting of the air velocity in feet per minute. Both walls permit passage of air outside the glass sample tubes. Sample holders are designed for insertion in the glass sample tube; they permit simple, quick change of specimen and prevent movement of the specimen during test. The standard 19- by 19- by 19-inch oven cavity conversion unit holds 16 tubes or 48 specimens.

In determining the uniformity of heat aging of vinyl compounds in this Apex tubular oven an air flow through the tubes of 400 fpm was found best, and uniformity of results between samples from each of the 16 tubes was good. The next step was to determine whether or not *different* tubular ovens could test the *same* compound under the same conditions with good reproducibility. Actually tests were made with three ovens on four different compounds. It was demonstrated that each of the three ovens reproduced aging conditions in its various tubes, and different ovens had the ability to provide equivalent aging conditions. This uniformity results even when different compounds are tested simultaneously.

The previously mentioned D-11 and D-20 task group on oven aging now plans a round-robin testing program with the Apex tubular ovens in order to obtain further information on performance of the units in different companies which will lead to the development of a reliable and reproducible test method. Arrangements for the manufacture of the Apex tubular conversion units have been made with the Tower Iron Works of Providence, R. I. It is expected that the task group will report at a future meeting on its continuing study.

"The Effect of Die Closure Pressure on Mooney Viscosity Determinations" was presented by N. N. Mueller, of the Du Pont elastomer chemicals department. Mr. Mueller pointed out that the Mooney viscometer, as originally designed, did the job expected of it and was adequate, but even though design changes have been made to improve reproducibility, the machine has limitations for studying high-viscosity polymers. Results of cross-check tests on 14 Mooney viscometers have shown poor correlation especially on polymers of high viscosity. The National Bureau of Standards has recommended pneumatic closures for greater reproducibility of results, and a pneumatic-type system has also been made available by Scott Testers, with the introduction of its new STI model.

Du Pont's elastomers laboratory has equipped an NBS model viscometer with a pneumatic closure to evaluate this modification for high-viscosity materials and compare the results to those obtained with the standard NBS-model Mooney viscometer.

Mooney viscosity data were obtained on both types of machines for butyl, neoprene, and Viton synthetic rubbers and natural rubber, and it was found that holding force is not important in the viscosity range below 75; however, the reverse is true for high-viscosity material. Below 750 pounds of total force, the viscosity drops rapidly with a small reduction in force. The pneumatic closure system, as developed by NBS, is essential in obtaining reproducible results on high-viscosity materials, the speaker further declared.

Mr. Mueller suggested that a holding force greater than 750 pounds, possibly 1,000 pounds, be considered as a standard requirement by ASTM for Mooney viscosity determinations. The author indicated that his studies would be continued in connection with the use of the Mooney viscometer for scorch tests as well as for viscosity measurements and hoped that others might conduct similar studies.

Subcommittee Reports

Subcommittee 4—Protective Equipment for Electrical Workers. Gordon Thompson, Electrical Testing Laboratories, Inc., chairman. The subcommittee chairman reported that as a result of letter-ballots in Committee D-11, the following tentative specifications will be advanced to standard: D 1048-49T, Spec. for Rubber Insulating Blankets (Without Fabric Reinforcement) (Proof test 16,000 volts, three minutes); D 1049-49T, Spec. for Rubber Insulator Hoods (Proof test 20,000 volts, three minutes); and D 1050-49T, Spec. for Rubber Insulating Line Hose (Proof test 20,000 volts, three minutes).

D 1051-52T, Spec. for Rubber Insulating Sleeves (Proof test 10,000 volts, three minutes), will be advanced to standard also with the editorial

changes of substituting "Proof-Test Current" for "Leakage Current" and the use of the rephrased text proposed for D 120-52T, Spec. for Rubber Insulating Gloves, under "Workmanship and Finish."

A new Tentative Specification for Low-Voltage Gloves will be letter-balloted in Committee D-11 with certain editorial changes and with voltage use limited to 750.

Subcommittee 5—Wire and Cable. C. H. Seaberg, General Electric Co., acting chairman. The subcommittee considered the single negative vote on the Committee D-11 letter-ballot in connection with the Tentative Specification for Synthetic Rubber Heat and Moisture Resisting Insulation for Wire and Cable, 75° C. Operation, dealing with the maximum values for dielectric constant and the gravimetric method for moisture determination and voted to retain the values in the letter-ballot.

The negative vote on items 1 and 2 of the subcommittee 5 letter-ballot of April 28, 1959, was withdrawn, and the subcommittee voted that all the items in this subcommittee 5 letter-ballot be recommended for letter-ballot in Committee D-11 and, if approved, for inclusion in the next compilation of D-11 standards.

Subcommittee 5 is continuing cooperative work with the joint D-11 and Committee D-20 task group on the oven aging of plastics.

The specification section's revisions of D 1351-54T, Spec. for Polyethylene Insulated Wire and Cable, and D 1352-54T, Spec. for Ozone-Resisting Butyl Rubber Insulation for Wire and Cable, and its new tentative specification for Black Polyethylene Jacket, will be letter-balloted in subcommittee 5 and Committee D-11, and, if approved, also included in the new compilation of D-11 standards.

The specification section will revise D 1350-58T, Spec. for Construction of Rubber Insulated Wire and Cable, in line with current practice. The scope of the specification will remain the same.

Subcommittee 6 — Packings. R. F. Anderson, B. F. Goodrich Co., chairman. A draft of a proposed specification for molded rubber gaskets for asbestos cement pipe was submitted by R. Fenstermacher, Keasbey & Mattison Co. The subcommittee felt that combination of an asbestos cement pipe gasket specification with the concrete pipe gasket specification should be explored. A task group headed by J. W. Axelson, Johns-Manville Corp., was established to develop specifications for molded gaskets for asbestos cement pipe.

Mr. Fenstermacher reported for the task group reviewing the proposed Committee C-13 specification for Flexible Watertight Rubber-Type Gasket Joints for Circular Concrete Sewer and Culvert Pipe. The subcommittee voted

Brooks Studio

N. N. Mueller

to pass the following recommendations on to Committee C-13 in connection with the concrete pipe gasket specifications: (a) Original tensile strength, 1200 psi. min. (b) Original hardness, three ranges, Shore A, 40 ± 5; 50 ± 5; 60 ± 5. (c) After 96 hours' air oven aging at 158° F. Tensile loss, —15% max.; elongation loss, —20% max. (d) Tolerances, Class 3, Commercial of the Rubber Manufacturers Association.

Obtaining hardness readings directly from molded rubber gaskets was discussed, and D. Messenger, Garlock Packing Co., reported that the O-ring group in SAE-ASTM Technical Committee on Automotive Rubber was studying this problem, and he will report to the subcommittee on its progress.

A report of the work in Section 10 of Technical Committee A on sealability, stress relaxation, dimensional stability, and corrosion with regard to gasketing materials was made by Mr. Kapps, F. D. Farnum Co., who also gave a status report on the findings of the study group for the industry opinion survey on gaskets and packings.

Subcommittee 7 — Rubber Latices. G. H. Barnes, Goodyear Tire & Rubber Co., chairman. The subcommittee is in complete agreement that the British Standards Institution's proposal CZ (RVC) 4435 on Determination of Density of Latex be submitted for consideration in D 1076-57T, Spec. and Methods of Test for Concentrated Ammonia Preserved, Creamed and Centrifuged Natural Rubber Latex. Authorization was given to a representative of subcommittee 7 to make minor changes at the ISO/TC 45 meeting in October, after which the method will be submitted to letter-ballot in the subcommittee.

Subcommittee 7 is in sufficiently close agreement with the ISO/TC 45 method for the determination of Volatile Fatty Acid Number to expect a generally acceptable method to be approved at the October meeting.

A study is being made in connection with reducing the KOH number specification in D 1076-57T, and a recommendation should be forthcoming on this item also at the next annual meeting of D-11.

A task group of the subcommittee is investigating a specification limit for the VFA Number, and a recommendation is expected at the next annual meeting of D-11.

A method for the determination of boric acid in low ammonia content latices preserved with boric acid was agreed upon and is also to be used for correcting the KOH number of such latices. The method will not be included in D 1076-57T, however, until there is wider use of this type of latex.

A task force has been established to develop a more practical method of determining the viscosity of latices and will report at the next annual meeting.

Typographical errors in D 1076-57T have been reported, and corrections recommended to ASTM.

Subcommittee 8—Nomenclature and Definitions. R. G. Seaman, RUBBER WORLD, chairman. Task group #1 headed by H. G. Bimmerman, E. I. du Pont de Nemours & Co., Inc., reported the results of the latest (May 5) subcommittee letter-ballot on definitions for rubber, rubber-like, and rubber products. Of the 21 votes returned, 16 were affirmative, 4 were negative, and one did not vote.

The reasons for the negative votes were read and discussed but without their being completely resolved. The proposed definitions were then read paragraph by paragraph with the object of making sufficient revisions, if possible, for submission to another letter-ballot in the subcommittee. It was then proposed by R. D. Stiehler, National Bureau of Standards, that the best approach would be to define rubber-like, rubber, and rubber products in that order. A motion to this effect was made by A. E. Juve, Goodrich, seconded, and passed, and the subcommittee began reconstructing the definitions again.

Definitions for rubber-like materials, rubber, and rubber products, and a quantitative extension-retraction test to identify the rubber in rubber products after the necessary processing and modification were developed. They will be submitted to letter-ballot first in subcommittee 8 and, if approved, in Committee D-11 for inclusion in D 1566-58T, Definition of Terms Relating to Rubber and Rubber-Like Materials.

The chairman of the subcommittee was authorized to appoint three members of subcommittee 8, including himself, to serve on a coordinating committee with the chairman and two

other members of the nomenclature committee of Committee D-20 on Plastics in order to resolve the conflict involving the identification and coding of certain elastomers in D 1418-58T, Recommended Practice for Nomenclature for Synthetic Elastomers and Latices, of D-11, and D 1600-58T, Abbreviations of Terms Relating to Plastics.

Task group 2, authorized at the February, 1959, meeting, but not yet appointed, will be established to develop coding and identification for the M or polymethylene family of elastomers in D 1418-58T, and eventually all of the families of elastomers for which this has not been done.

The subcommittee chairman will review the present and possible future assignments of subcommittee 8 in a memorandum to its members with the the request for comments on plans for future work. Additional interested members of D-11 will be invited to join the subcommittee.

Subcommittee 10—Physical Testing. L. V. Cooper, Firestone Tire & Rubber Co., chairman. Several requests have been made to the chairman of subcommittee 10 for the development of ASTM methods for tension testing of vulcanized rubber at elevated temperatures. The chairman of subcommittee 10 was authorized to appoint a task group to develop methods for tension testing at other than room temperatures and to recommend the necessary changes in D 412-51T, Method of Tension Testing of Vulcanized Rubber, to provide for such testing.

D. C. Scott, Jr., Scott Testers, Inc., Chairman of the Committee E-1 task group on the calibration of tensile machines, reported that this work is under way, with the scope of the investigation being limited to machines with less than 2,000 pounds' capacity.

D. C. Messenger, Garlock Packing, in reporting for the task group responsible for rewriting D 1414-56T, Method for Tension Testing of O-Rings, said that the first questionnaire had been sent out, but that not enough replies had been received to make a progress report.

The subcommittee voted to recommend that D 1456-57T, Methods of Strain Testing of Vulcanized Rubber, be continued as a tentative standard for another two years.

Subcommittee 11—Chemical Tests. W. P. Tyler, Goodrich, chairman. The task group on reorganization and revision of D 297-55T, Methods for the Chemical Analysis of Rubber Products, and D 833-46T, Methods of Analysis and Identification of Synthetic Elastomers, outlined these reorganizations and presented new scopes for most of the procedures. Detailed rewrite assignments will now be made to clarify the application of the methods to natural and synthetic rubber products.

The results of a cooperative testing program on the determination of zinc, titanium, and butyl rubber were discussed, and since these results were not very good, the philosophy of testing programs, particularly with respect to the amount of experience desirable in testing new procedures, was reviewed.

Any further testing programs in the immediate future will be limited to testing procedures needed to fill the gaps in D 297-55T, especially those for the direct determination of synthetic rubber content of rubber compounds.

Subcommittee 12—Crude Natural Rubber. Norman Bekkedahl, NBS, chairman. The chairman explained that the work of the subcommittee had reached a plateau in the completion of D 1278-58T, Tests for the Chemical Analysis of Natural Rubber, and that it was now necessary to consider the direction of future work.

Mention was made of the comments received on the article by the chairman and secretary of subcommittee 12 entitled, "The ASTM Crude Natural Rubber Subcommittee—Organization, History, and Accomplishments," which appeared in the February, 1959 issue of RUBBER WORLD. In connection with one of these comments by S. J. Pike, of S. J. Pike Co., Mr. Pike had been invited to attended the subcommittee 12 meeting and give his views on the work of the subcommittee and its relation to natural rubber production and marketing as he saw it.

Mr. Pike explained that since the aim of the ASTM specifications, if and when adopted, was obviously to obtain improved quality rubber, this same result could be achieved by purchasing a higher grade as identified by International Type Descriptions. He emphasized that tighter requirements in buying rubber for the United States would be likely to reduce its availability since natural rubber was in short supply, and producers could and would sell this rubber elsewhere without as much trouble. Mr. Pike suggested that future work of subcommittee 12 should be separated into study of estate and native rubber.

A report of the task group headed by L. G. Mason, Goodrich, on the use of D 1278-58T and D 297-55T in a round-robin program with NBS standard natural rubber No. 385 stated that not enough data had been collected, but poor agreement was evident with some tests. Further work will have to be done on modification or interpretation of some of the procedures in these methods.

Dr. Stiehler reported that NBS had found evidence of high manganese and copper in Nos. 1, 2, and 3 ribbed smoked sheets in the government stockpile in rubber purchased during the past two years.

It was reported also that U. S. consumers had found high ash content in some lots of Nos. 3 and 4 Ambers, and that this underscored the need of more detailed information in order to consider corrective measures. It was suggested that action be taken by individual consumers to discourage the use of excess talc and soapstone in and between the books in the bales of Nos. 3 and 4 Ambers which is becoming more and more prevalent even though the International Type Descriptions forbid such practices.

Dr. Bekkedahl announced that he was resigning the chairmanship of subcommittee 12 because his present work and interest were becoming less and less related to natural rubber. At his request and with the approval of the officers of Committee D-11, Mr. Mason has accepted the chairmanship of the crude natural rubber subcommittee.

A vote of approval was registered by all present to Dr. Bekkedahl for his 10 years of service as chairman of subcommittee 12 and which were so well summarized in the above-mentioned article in the February, 1959, issue of RUBBER WORLD.

Subcommittee 13—Synthetic Elastomers. B. S. Garvey, Jr., Pennsalt Chemicals Corp., chairman. Section 1 on Sampling, headed by L. G. Mason, reported that the revision of D 1485-57T, Sampling and Sample Preparation of Synthetic Elastomers, to include a method for sampling SBR black masterbatches has been delayed because of the difficulty of securing a means of finding the wettest portion of bales of this type of rubber since white spots due to moisture do not show up. A moisture meter to scan quickly cut surfaces of the bale is needed. Also, volatile content values must be obtained from producers for checks by analysis and determination of control limit values.

The Section 2 on Chemical Tests report was made by E. J. O'Connor, Goodrich-Gulf Chemicals, in the absence of B. C. Pryor, of the same company. After some discussion it was voted to delete Viscosity Gravity Constant classification limits from Table IV in the annual D-11 report in connection with paraffinic, naphthenic, aromatic, and highly aromatic oils used in SBR and intended as part of the revision of D 1419-58T, Description of Types of Styrene-Butadiene Rubbers. The chairman of subcommittee 13 was authorized to appoint a task group to investigate methods of test as means of classification of oils as used in SBR and for eventual inclusion in D 1419-58T. It was indicated that the task group would consist of two representatives each from oil producers, synthetic rubber producers, rubber products manufacturers, and a neutral chairman.

Mr. O'Connor and R. S. Hammer, Phillips Petroleum Co., reported on the results of a round-robin on a method for the determination of oil in oil-extended SBR. It was voted to submit the method to letter-ballot in sub-

committee 13 and, if approved, to letter-ballot in Committee D-11.

The results of a round-robin on a method for the determination of the color of raw polymers was also presented by Mr. O'Connor. Work will be continued on this method in order to obtain a satisfactory method for presentation to the subcommittee.

Section 3 on Physical Tests report was made by H. R. Norsworthy, Texas-U. S. Chemicals. Round-robin tests with the recipe for SBR 1502 or 1712, as given in the minutes of the February, 1959, meeting of the subcommittee, showed that the accelerator-sulfur ratio provided too fast a cure and therefore could not be recommended. Work will be continued on this project using HAF black reference lot No. 1, 40 parts; zinc oixde, 5 parts; sulfur, 2 parts; benzothiazyl disulfide or mercaptobenzothiazole, 2 parts; on 100 parts of either SBR 1502 or 1712.

It was voted to submit to letter-ballot in subcommittee 13 seven recipes for testing SBR's for incorporation in the new Table 12 of D 15-57T, which table will replace the former Table 2 in this method. No recipe for oil-black masterbatches was submitted, and the task group will continue its work in an effort to present a recipe based on 100 parts of polymer only.

The task group headed by G. C. Maassen, R. T. Vanderbilt Co., assigned to develop new wording for paragraph 2 (b) of D 1419-58T relating to "experimental" SBR's, reported certain changes and revisions which will be letter-balloted in the subcommittee.

Subcommittee 15 — Life Tests. G. C. Maassen, chairman. The task group headed by G. N. Vacca, Bell Telephone Laboratories, on oven aging of plasticized polyvinyl chloride and highly plasticized elastomers reported that two round-robin test programs have been completed in ovens, presumably conforming to ASTM specifications and according to ASTM procedures, and the present ovens were shown to be inadequate for producing reproducible results. Variations in air flow rates, shelf arrangements, etc., did not improve the results. The Royen tube-type oven, as described before the joint meeting of Committees D-11 and D-20 on June 25, did give satisfactory results in tests performed to date. Several companies are obtaining conversion equipment to make their present ovens equivalent to the Royen tube-type, and a third round-robin will be conducted when these are in operation. The Latham baffle system will also be included in this new test program.

The task group on ozone testing, headed by A. G. Veith, Goodrich, reported the results on a questionnaire circulated to obtain comments and suggestions on D 1149-55T, Method of Test for Accelerated Ozone Cracking of Vulcanized Rubber. Based on replies received, it was voted to rewrite D 1149-55T and submit it to subcommittee 15 for comments and criticisms prior to requesting letter-ballot in Committee D-11. D. J. Milnes, Ozone Research & Equipment Corp., suggested that the work of the ozone testing task group should be coordinated with that of Technical Committee A to avoid duplication of specifications, and Mr. Veith, himself a member of Tech A, will arrange for such coordination.

Portrait by Roberts

Markus Royen

Mr. Milnes suggested also that work should be started toward standardizing methods and procedures for dynamic ozone testing, and it was voted to give consideration to developing a dynamic ozone test method, with a task group headed by Mr. Milnes and to include automotive industry representatives.

The task group on weathering headed by J. E. Norton, Atlas Electric Devices, reported that the plastic chip method of determining light sources is being letter-balloted in Committee D-20, and an article is being prepared for publication in the *ASTM Bulletin*. Pending approval of this method, the task group recommended that D 750-55T, Method of Test for Resistance to Accelerated Light Aging of Rubber Compounds, remain a tentative standard for another year and be revised when the plastic chip method is approved.

It was voted to recommend that D 749-43T, Method of Calibrating a Light Source Used for Accelerating the Deterioration of Rubber, be transferred to the jurisdiction of Committee E-1, subcommittee 15. Mr. Norton reported that the reproducibility of tests made using Xenon lamps was poor at present, but tests are continuing with various lamps.

The task group on the discoloration of light-colored products, headed by A. E. Hicks, General Tire & Rubber Co., has not been successful in gathering satisfactory information on test procedures for evaluation of migration, stain, or discoloration and requests suggestions in this connection.

The Tech A Committee is now interested in D 1206-52T, Method of Test for Resistance to Aging of Vulcanized Rubber by Measurement of Creep, and it was decided to continue this method until the extent of Tech A interest is determined.

Subcommittee 15 recommended that the paper, "A Study of Accelerated Aging of Vinyl Compounds in a Modified Testing Oven," by Markus D. Royen, Apex Tire & Rubber Co., and presented by A. E. Polson, of the same company, at the joint D-11 and D-20 meeting be published in the *ASTM Bulletin* as soon as possible.

Subcommittee 16 — Description and Classification of Rubber Compounds. J. F. Kerscher, Goodyear, chairman. The task group authorized at the February, 1959, meeting of the subcommittee to work with Section IV D-3 of Tech A on the development of the "expanded tabular system" of D 735-58T, Spec. for Elastomer Compounds for Automotive Applications, will consist of Dr. Stiehler, Dr. Garvey, C. M. Hill, Bell Labs, and Mr. Kerscher.

It was explained that this expanded tabular system provides a complete and adequate classification in *two* tables, one, a table listing properties that should be met by all properly formulated and vulcanized elastomeric compounds for normal use, and, second, a table of suffix requirements that enables the purchaser to select the specific quality he needs. The first table for separating elastomeric vulcanizates by *types* is based on resistance of any vulcanizate to changes in tensile strength of not more than ±30%, elongation of —40%, and hardness of ±15 points after air oven aging at an appropriate temperature. All types are further separated as to *class* on the basis of their swelling in ASTM Oil No. 3 after 70 hours' immersion at a temperature determined from the type table up to 150° C.

Complete details of this system are explained in a paper by N. L. Catton, Du Pont, R. C. Edwards, Chrysler Corp., and T. M. Loring, Michigan Precision Molded Products, to be given at the Internation Rubber Conference in Washington, D. C., in November.

Section IV D-3 hopes by September to classify some 220 Armed Forces compounds according to the expanded tabular system.

ISO TC/45 WG 6 documents 398 and 400 on the Netherlands compound classification system which were objected to by the American delegation have been revised, by the Netherlands delegation, and new WG 6 documents 13 and 14 on this system were distributed to subcommittee 16. Most of the suggestions of the American delegation are incorporated in these revisions.

Since subcommittee 16 has never been entirely in accord with the basic thinking in documents 13 and 14, copies of the Catton, Edwards, Loring paper on the expanded tabular system will be offered to WG 6 as representative of the current thinking of the United States delegation: this paper more fully describes what is desired. The paper will be forwarded in time to permit the ISO/TC 45 group to study it prior to its meeting in New York in October.

Subcommittee 17 — Hardness, Set, and Creep. S. R. Doner, Raybestos-Manhattan, Inc., chairman. Owing to the serious illness of Mr. Doner, the secretary of D-11, J. J. Allen, Firestone, was acting chairman for this meeting.

Ross Shearer, Goodrich, reported that lubrication of compression set test specimens showed no advantage over the present method in preparing specimens as outlined in D 395-55, Methods of Test for Compression Set of Vulcanized Rubber. The use of abrasive cloth was also included in this investigation. It was recommended that ISO/TC 45 be advised of these results and informed that ASTM D-11 does not see any reason to revise D 395-55 to provide for lubricated specimens, and that the details of this work be published in the *ASTM Bulletin*. It was also reported that the use of abrasive cloth as an alternate method gives compression set results significantly higher than when the regular D 395-55, Method B, was used.

It was reported by Mr. Shearer also that compression set results were essentially the same whether molded or cut specimens were used, and it was therefore recommended that D 395-55 be revised to permit the use of molded specimens. The dimension of the mold cavity rather than those of the molded specimen will be specified. Several companies who have data on the use of the molded specimen will send this information to Mr. Shearer.

The compression set task group will revise the entire D 395-55 method in order to bring it up-to-date in all respects, including adding to the deflections specified with Method B to provide for stocks of 95 and higher hardnesses.

The subcommittee will consider also revisions of the Shore A and Shore D hardness methods to provide for the use of the Shore D instrument in place of the Shore A for the range of 80-100 Shore A.

Subcommittee 19 — Tests for Properties of Rubber and Rubber-Like Materials in Liquids. F. H. Fritz, Du Pont, chairman. It was reported that Reference Fuel C was approved by D-11 letter-ballot for inclusion in D 471-57T, Method of Test for Change in Properties of Elastomeric Vulcanizates Resulting from Immersion in Liquids. The editorial changes to D 471-57T relative to weighing methods were approved after addition of the phrase "when handling materials that tend to volatilize at room temperature," which gives consideration to the one negative vote during the subcommittee 19 letter-ballot.

D. E. Manning, Pratt-Whitney Aircraft, has accepted the chairmanship of task group A, replacing A. C. Simon, H. O. Canfield Co., who resigned. Mr. Manning reported on reorganization of the task group and outlined present plans for achieving its objective in connection with further changes in D 471-57T in the fields of test fluids and procedures.

D. S. Messenger, Garlock Packing, chairman of the O-ring section of subcommittee 10, presented a report on the proposed changes in D 1414-56T, which includes two possible methods for making fluid immersion tests. One method is similar to the method in D 471-57T; the second is based on the work of R. Murray at the Wright Air Development Center and is found in Tech. Report 58-18, "Investigation of Oil Aging Procedures for Elastomeric Materials," copies of which may be obtained from ASTIA Document Service Center, Knott Bldg., Dayton 2, O. Since the results of this WADC work (which have been incorporated in MIL-R-6372) are pertinent to task group A, the report will be referred to it for consideration.

Subcommittee 21 — Cements. John F. Anderson, Goodrich, chairman. The meeting of subcommittee 21 was preceded by meetings of task groups 2A on textile adhesion and 2B on wire cord adhesion. A. E. Hicks, General Tire, is chairman of task group 2. Task group 2A, under George R. Harrison, Du Pont, reported reasonable reproducibility among several laboratories on adhesion of rayon tire cord to rubber in three tests: H-Test, General Tire; Pop Test, Goodrich; and Pull-Out Test, Firestone. Insufficient data prevented any conclusions regarding the U-Test, Goodyear. Further work using the H-Test will be done since participating laboratories experienced from two to 12 cord breaks out of 15 tests conducted. It is felt that the use of a ¼-inch mold instead of the conventional ¾-inch mold will eliminate these breaks.

Task group 2B under R. E. Hertzog, John A. Roebling's Sons Co., reported some delays in collecting data, but a program is in progress whereby molds, rubber stock, and wire samples are being circulated among nine laboratories for evaluation of types of molds and consistency of results. Five tire company laboratories and four bead wire producers' laboratories are participating in the work. Molds and rubber stocks from Goodyear and Goodrich were selected for the initial tests; wire is being supplied by National Standard Co.

Task group 1 headed by C. R. Lupton, Bendix Aviation Corp., reported completion of the development of a non-destructive test of bonds between friction materials and metal, specifically as applied to transmission bands. With the help of suggestions by J. C. Smack, Curtis-Wright Corp., and H. E. Van Valkenburg, Sperry Products, Inc., both of Committee E-7, a negative vote on the method was resolved. Reference to the method as being accomplished by means of "a resonance-type tester" and further reference to E 113-55T, Recommended Practice for Ultrasonic Testing by the Resonance Method, will be incorporated as an editorial change in the "Non-Destructive Test," which is to become a part of D 1205-58, Method of Testing Adhesives for Brake Linings and Other Friction Materials, or a separate test under the jurisdiction of subcommittee 21, as may be decided by the officers of D-11.

H. Macey, Goodrich, was asked to serve as liaison representative between subcommittee 19 and Committee E-7, and Mr. Lupton agreed to serve as liaison between subcommittee 19 and the Tech A section on brake band tests.

Subcommittee 22—Cellular Rubber. H. G. Bimmerman, Du Pont, chairman. This meeting of subcommittee 22 included members of Section IV-N of the Technical Committee on Automotive Rubber meeting in Atlantic City at about the same time.

A. F. Sereque, B. F. Goodrich, Sponge-Rubber Products, suggested that the method of calculating water absorption of cellular rubbers in D 1056-58T, Specs. for Sponge and Cellular Rubber Products, be revised and based on % by volume of water absorbed instead of % by weight. The specific gravity of the material will not have so much apparent effect on the results on this basis. Mr. Sereque will rewrite this part of the method and revise the tables in D 1056-58T for letter-ballot in the subcommittee.

G. H. Barnes, Goodyear, presented the results of work done by the Society for the Plastics Industry and suggested limits for tables of properties of flexible urethane foam for D 1564-58T, Specs. and Tests for Flexible Urethane Foam. He also presented proposed revisions for D 1565-58T, Specs. and Methods of Test for Flexible Foams Made from Polymers or Copolymers of Vinyl Chloride, and for D 1055-58T, Specs. and Methods of Test for Latex Foam Rubbers. The proposals incorporated suggested changes in designating grades for foams as follows: RC, Rubber Cored; RU, Rubber Uncored; VC, Vinyl Cored; VU, Vinyl Uncored; UC, Urethane Cored; UU, Urethane Uncored. These letters will be followed by one, two, or three digits to indicate the pounds required to produce 25% deflection with a 50-square inch indentor.

For example, RC-5, Cored Rubber Foam, 5 pounds; RU-150, Uncored Rubber, 150 pounds.

For sponge the following method of designating grades is proposed: RO, Rubber Open Cell; RG, Rubber Closed Cell; VO, Vinyl Open Cell; VE, Vinyl Closed Cell; SBO, Nitrile Open Cell; SBE, Nitrile Closed Cell; SCO, Neoprene Open Cell; SCE, Neoprene Closed Cell. The digits following these letters will not represent the psi. required for 25% deflection, but will remain as shown in D 1056-58T, since this procedure is desired by sponge manufacturers and consumers at this time.

A letter-ballot will be circulated in the subcommittee in connection with setting up the tables according to the above plan in D 1055-58T, D 1056-58T, D 1564-58T, and D 1565-58T. A new test for the resiliency of urethane foam will be submitted to subcommittee letter-ballot at the same time.

The need of flammability tests was discussed, and some preference was shown for the new tentative method presented on page 13 of the preprint of the 1959 annual report of Committee D-20. This proposed method will be circulated in subcommittee 22 for comments.

C. S. Yoran, Dryden Rubber Division, Sheller Mfg. Corp., indicated the concern of the Society of Automotive Engineers' seating committee on the variation of indentation load deflection results among different laboratories. The SAE group is also concerned about additional tests which may be needed to characterize urethane foam for automobile seating applications.

Subcommittee 23 — Hard Rubber. W. J. Dermody, Electric Storage Battery Co., chairman. The task group working on the revision of D 530-57T, Methods of Testing Hard Rubber Products, and D 639-57T, Methods of Testing Asphalt Composition Battery Containers, recommended these revisions for letter-ballot in subcommittee 23. The revision of D 530-57T includes a revision of the ball-drop impact test, a new rupture resistance and distention procedure, and many editorial changes. D 639-57T has been extensively rewritten, and the scope broadened to include battery containers made of hard rubber and equivalent materials.

Two negative votes were registered against advancing D 1484-57T, Method of Test for Penetration of Hard Rubber by Type D Durometer, to standard. These votes were made in view of the action of Committee D-20 which plans a hardness standard including use of the Shore A and Shore D durometers in one method. Subcommittee 23 feels that any objections based on possible duplication between D 1484-57T and the proposed D-20 method should be raised in the Plastics Committee, and that since the negative votes were concerned primarily with inter-committee procedure, D 1484-57T should be advanced to standard, and it was so voted.

A representative of D-20 presented the view of that committee on this subject, which was as follows: (1) A separate standard for plastics is both necessary and desirable. (2) The standard for plastics should include the use of both the Shore A and the Shore D durometer, regardless of the differences in the calibration methods for the two instruments and the fact that neither D 530 nor D 638 tensile specimens would meet the specimen size limits of the new procedure. Subcommittee 23 does not agree with the position of D-20 and feels that the suggested procedure will confuse rather than simplify the situation.

Task group 4 will prepare a second proposal for a system of hard rubber classification by grades, and two more members were added to this task group.

E. C. Harrington has been appointed D-20 liaison representative on subcommittee 23.

Subcommittee 24—Tests for Coated Fabrics. K. L. Keene, United States Rubber Co., chairman. No interest was evidenced in the subcommittee of a proposed British standard for air-permeable PVC coated fabrics for upholstered furniture, which had been received.

The chairman reported that no reply had been received to the request of subcommittee 23 for assistance on the problem of coated fabrics abrasion from the ASTM research group.

The proposed method for tack tear resistance will be submitted to letter-ballot in the subcommittee.

Permission will be requested of Committee D-11 to change the title of D 571-58T from Testing Rubber Coated Fabrics to Testing Coated Fabrics and to revise the scope to read "These methods describe procedures for the testing of coated fabrics." In addition the chairman of the subcommittee will review and revise where necessary the contents of D 751-58T for consistency in view of the proposed new title and scope.

A progress report was made by the task group on flammability tests, and this work is being continued.

W. H. Bryan, Du Pont, discussed the work on cold cracking that he had described to subcommittee 25, which is investigating such methods for subcommittee 24.

The letter-ballot in subcommittee 24 on the revision of the adhesion test in D 571-57T resulted in 12 affirmative, two negative, and one not voting. The negative votes were resolved, and the revision will be submitted to letter-ballot in D-11.

Subcommittee 24 is requesting that subcommittee 10 include tension testing machines other than the pendulum type for tension testing.

J. E. Hovoraka, Ford Motor Co., requested a new section of subcommittee 24 be established for the development of test methods and standards for coated fabrics used in the automotive industry. The chairman of subcommittee 24 will determine the extent of interest and, if warranted, will consider setting up such a task group.

Subcommittee 25—Low-Temperature Tests. R. S. Havenhill, St. Joseph Lead Co., chairman. Subcommittee 25 met with Section IV-L of Tech A. Irving Kahn, Watertown Arsenal, and R. E. Ofner, Rock Island Arsenal, summarized the activities of ISO/TC 45 in the field of low-temperature testing. The 0.25-inch width specimen was recommended for replacement of the narrow parallel sided specimen in ISO/TC 45 Document 389 on Low-Temperature Brittleness and, if adopted, would bring the ISO/TC 45 method in conformity with ASTM D 746-57T, Method of Test for Brittleness Temperature of Plastics and Elastomers by Impact, as regards specimen size. Germany, Italy, and Sweden have submitted data in connection with the low-temperature compression set round-robin.

Committee D-20 has requested further comparative tests before agreeing to the use of the gravity operated striker in D 746-57T. Mr. Ofner will supply several stocks to G. W. Goodson, Sperry Gyroscope, so that comparative tests, at the same measured velocity, can be obtained with the solenoid and gravity operated machines.

A letter from W. H. Reynolds was read which stated that Aminco was modifying the Gehman apparatus to meet the latest revision of D 1053-58T, Method of Measuring Low-Temperature Stiffening of Rubber and Rubber-Like Materials by Means of a Torsional Wire Apparatus, which calls for a separate head for use with a liquid bath or in a cold box.

W. H. Bryan, Du Pont, head of task group on low-temperature tests for coated fabrics, reported that a questionnaire had been sent to 26 producing and consuming companies to determine if individual requirements could be met with a single standard test. He analyzed 20 different types of tests now in use and divided them into five categories for further review. L. R. McManus, Quartermasters Research & Development; Mr. Goodson; H. G. Winter, Cadillac Motor Co.; K. L. Keene, U. S. Rubber, and representatives from Chrysler, Ford, and Committee D-9 will become members of Mr. Bryan's task group. D. C. Scott, Scott Testers, and Mr. Winter will send details of special fabric testing equipment to Mr. Bryan for study by his group.

The meeting was then turned over to E. R. Cole, chairman of Section IV-L of Tech A.

Subcommittee 26 — Processibility. R. H. Taylor, Scott Testers, chairman.

The proposed revision and combination of D 927-57T, Method of Test for Viscosity of Rubber and Rubber-Like Materials by the Shearing Disk Viscometer, and D 1077-55T, Method of Test for Curing Characteristics of Vulcanizable Rubber Mixtures during Heating by the Shearing Disk Viscometer, as circulated to the subcommittee prior to the Atlantic City meeting by Ross Shearer, chairman of the task group on this problem, were reviewed in detail, and certain minor changes agreed upon. The proposed combined method will be submitted to letter-ballot in D-11 to replace D 927-57T and D 1077-55T.

J. F. Kerscher, head of the task group on extrusion dies, reported that a die had been selected that should meet immediate needs. Those interested in investigating the suitability of the proposed die should contact Mr. Kerscher for information as to how it may be obtained.

Subcommittee 27—Resilience Tests. W. A. Frye, Inland Mfg. Division, General Motors Corp., chairman. The D-11 letter-ballot on D 945-55, Methods of Test for Mechanical Properties of Elastomeric Vulcanizates under Compressive or Shear Strains by the Mechanical Oscillograph, was reviewed. The chairman will survey users of the Yerzley oscillograph to decide if a program to determine interlaboratory reproducibility is desired.

D 623-52T, Methods of Test for Compression Fatigue of Vulcanized Rubber, was discussed, and selected laboratories will be contacted to determine standard conditions used with the Goodrich flexometer and to obtain suggestions for future action.

The first draft of a possible recommended practice for forced vibration testing was presented; it is informative in nature and describes several methods now in use. This draft will be circulated to interested parties for comments and suggestions, and any member of D-11 may obtain a copy by addressing the chairman of subcommittee 27.

Subcommittee 29—Compounding Ingredients. A. E. Juve, Goodrich, chairman. The task group headed by Ralph Treat, J. M. Huber Corp., reported on the evaluation of the statistical procedure and the data obtained in connection with the preparation of the 300,000-pound lot of reference HAF black. Six 10,000-pound lots were rejected, leaving a net of 240,000 pounds of this reference lot, of satisfactory uniformity. It was suggested that before any future reference lots are prepared a similar task group be given an opportunity to suggest a well-designed statistical test plan. The task group has the additional assignment of setting up tests to measure any possible changes in the reference lot due to storage conditions, etc. One test after three months and another after six have not indicated any observable changes in this HAF reference lot.

The task group headed by Tom Bolt, Godfrey L. Cabot, Inc., has been evaluating proposals of a carbon black producers group for modification of D 1522-58T, Methods of Testing Carbon Blacks in Rubber. These included use of a single recipe based on natural rubber with short cures for furnace blacks and long cures for channel blacks, a single 50 phr. black loading (except MT and FT blacks), and a single reference black for all testing. The task group recommended that the proposals be adopted and incorporated into a rewrite of D 1522-58T, but that action on it by D-11 be deferred until the revision of D 15-57T, Methods of Sample Preparation for Physical Testing of Rubber Products, is completed.

A task group will be appointed to prepare specifications for carbon blacks based on the revised D 1522-58T as a test method and on the extensive data now available on a variety of black grades. The proposed specification is to include properties of the blacks themselves as well as their properties in rubber. The methods for the carbon black properties as such are under the jurisdiction of Committee D-24 on Carbon Blacks. The task group will be headed by John Gifford, Witco Chemical Co.

As soon as the revised D 1522-58T is written, and the specifications are available, arrangements will be made for some producer-consumer combinations to start using them, even before letter-balloting in D-11 in order to accumulate some experience with their use.

H. R. Norsworth, a member of the subcommittee 13 task group on test recipes for SBR, gave a report of the progress of this work.

D. R. Hammel, Enjay Co., proposed that the procedures for mixing and vulcanizing butyl rubber-carbon black stocks in D 15-57T be modified to conform to the practice of the production plants, one part of which would mean changing the curing temperature from 302 to 307° F. A task group will be established to consider the proposal.

Technical Committee A

The report of the activities of the SAE-ASTM Technical Committee on Automotive Rubber was submitted by H. Tangenberg, Goodrich, secretary.

New officers of Tech A installed at the March meeting are W. J. Simpson, Chrysler Corp., as chairman, and R. C. Waters, General Motors Truck & Coach Division, vice chairman. There were no new letter-ballots approved at this meeting.

The proposed replacement of D 736-54T by the D 746-57T cold brittleness test has not met with the approval of SAE and has been returned to Sub Section IV-L. (At the meeting on June 24 negative votes were overridden, and D 746 will replace D 736 in D 735).

The automotive hose group is continuing its work on the automotive air-conditioning hose specification; while the air-conditioning hose method of test is up for consideration by ASTM. Work on coolant hose is being considered.

The new Section X on Gaskets has been quite active on specifications and new materials; while ASTM is still considering the recommendations of the study group. Section XI-A with a new chairman, H. G. Gillette, Precision Rubber Products Co., is active in the fields of O-rings and rectangular seals.

Section IV-D has added task groups on neoprene under B. A. Anderson; nitrile rubbers, under N. Duke; and R tables, under M. Lowman. Other Section IV activities include the following: evaluation of gear lubricants and transmission fluids in Section IV-H; urethane foam tables and nomenclature in IV-N; review of silicone compounds in IV O-1; progress on a natural rubber latex product specification and a start on neoprene latex products; continued progress on adhesion to metal; an investigation of stress relaxation.

Tech A and Section IV approved using the key pages in D 735 as a place for information on the properties of new materials.

Committee on Elastomeric Sealants

A steering committee on joint sealants was convened by ASTM on June 10 in Philadelphia for the purpose of discussing the formation of a committee on elastomeric joint sealants as used by the building industry. Various industry representatives attended, and ASTM Committee D-1 on Paints, Varnish, Lacquer and Related Products was represented by Harry Kelfer; D-11 was represented by J. R. Panek, Thiokol Chemical Corp.; and the National Bureau of Standards by Mr. Parson, who was designated chairman of the steering committee.

The steering committee took the following actions:

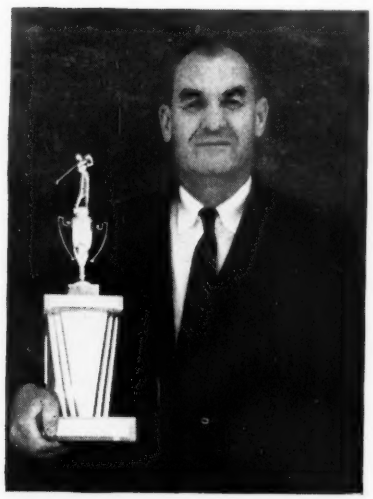
1. It was felt that a new committee would best serve the industry and its needs, and a new ASTM Committee on Elastomeric Sealants will be formed.

2. The scope of the new committee was defined as: "To develop test methods, classifications, nomenclature, and performance specifications for elastomeric sealing materials for use by the construction industry for sealing joints. Typical sealants include elastomeric caulking and glazing compounds and preformed gaskets and tapes."

3. W. Koppes was nominated for chairman, R. Humpl for vice chairman, and Mr. Panek for secretary of the new committee.

One more meeting of the steering committee will be held during the latter part of August after indicated interest becomes known following announcement of the formation of this new

committee by ASTM. A list of manufacturers, users, associations, and interested parties involved in the use of joint sealants was supplied to ASTM. It is expected that the action at this August meeting of the steering committee will be the selection of a chairman for the polysulfide subcommittee which will be involved in improving the performance specification developed by the Building Trades Specification Committee, the Rubber & Plastic Adhesive & Sealant Manufacturers Council, and the National Association of Architectural Metal Manufacturers.



R. A. Claussen wins Witco Trophy

NCRG Golf Outing

The June 19 meeting of the Northern California Rubber Group was combined with the annual golf tournament held at the Green Hills Country Club, Millbrae, Calif.

R. A. Claussen, H. K. Porter Co., was awarded the Witco Perpetual Trophy for his low net for the course. The trophy, presented to the Group by Witco Chemical Co., will be awarded each year to the winner of the tournament. In the event that one person wins twice, the cup will remain permanently in his possession, with Witco providing a new trophy for future tournaments. Al Federico, C. P. Hall Co., and Wally Jensen, Burke Rubber Co., tied for second low net and were awarded an ice crusher and a Chargalite flashlight, respectively. D. Kutnewsky, Burke Rubber, was presented with a practice ball for his high gross score.

Dan Robertson, Titanium Pigments Corp., was chairman of the tournament with Joe Mattson, Witco Chemical, as his assistant. Following the golf match and dinner, the 35 members and guests were entertained by an All Star film featuring a match play between Sam Snead and Carey Middlecoff.

The next scheduled event for the Group is the summer outing to be held September 12 at Turtle Rock Ranch near Danville, Calif.

Committee D-11 Assigns New SBR Number

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials through Subcommittee 13 on Synthetic Elastomers of D-11 has assigned number 1509 to a new styrene-butadiene elastomer, requested by Shell Chemical Corp.

DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMER—ASSIGNMENT OF NEW CODE NUMBERS—ASTM D-11 1419-58T

Number as assigned	1509
Date assigned	7/2/59
Requested by	Shell Chemical Corp.
Distinctive feature	alum coagulation-intermediate viscosity
Close previous number, if any	1506, 1507
Type	1509
Nominal temp., °F.	43
Activator	FRA
Shortstop	ND
Antioxidant	NST
Catalyst	OHP
Emulsifier	mixed
Nominal bound styrene, %	23.5
Conversion, %	60
Mooney viscosity, ML 14 (212° F.)—polymer	34
Coagulation	BR-AL
Finishing	normal
Standard formula in D 15 for this rubber, Table III, D 15-57T	2B

Note: Abbreviations and symbols are defined as follows:
FRA=free radical type, i.e., iron-pyrophosphate, peroxamine sulfoxylate.
ND=non-discoloring.
NST=non-staining.
OHP=organic hydroperoxide
BR-AL=brine-alum.

SWE Honors Le Beau

D. S. le Beau, director of research for Midwest Rubber Reclaiming Co., East St. Louis, Ill., has received the 1959 award of the Society of Women Engineers as the woman of the year in the United States making a significant contribution to engineering achievement. The presentation was made on June 6 at the Society's banquet climaxing the annual national convention held in St. Louis, Mo.

Early this year Dr. Le Beau received another recognition and honor when she was selected as one of the Ten Women of Achievement for 1958 in St. Louis. This award was made by Richard H. Amberg, editor of the *St. Louis Globe Democrat*, to Dr. Le Beau for contributions in the field of business. The other nine recognitions were awarded to leaders in such fields as science, education, health, community service, fine arts, etc.

Dr. Le Beau was chosen for the Women Engineers Award from a group of nominees by an award review board composed of: R. G. Owens, Illinois Institute of Technology; C. E. Graham, Wilson Laboratories; Tom E. Campbell, *Iron Age;* D. K. Chinlund, Illinois Bell Telephone Co.; Kay E. Broughton and Mary L. Murphy, both of Society of Women Engineers.

Catherine Eiden, president, Society of Women Engineers, presents certificate to Dr. D. S. le Beau *(left)*

Buffalo Golf Outing

The Buffalo Rubber Group held its annual golf outing in perfect weather at Lancaster Country Club, June 9.

An attendance of 132 applauded the presentation of a trophy to the winners of the low gross, W. E. Harris, General Electric Silicone Division, and J. J. McGuire, Franklin Refining Co. Low net honors went to Phil Lawrence, B. F. Goodrich Chemical Co.

Prizes were awarded to the following low net winners, in descending order of skill: Robert Prior, Hewitt Robins, Inc.; Emery E. Slaght, Stanley Chemical Co.; Ralph Weaton, St. Joseph Lead Co.; E. J. Helmbrecht, Hewitt Robins; Harold Green, Dunlop Tire & Rubber Co.; F. Morrow, Dunlop; M. H. Hicky, Hewitt Robins; J. B. Kelly, Hewitt Robins; C. Monochina, Dunlop; and F. A. McGrath, Ashland Oil & Refining Co.

Dubious honor of most lost balls was earned by John T. Frankfurth, U. S. Rubber Reclaiming Co. Spotless winners of the egg throwing contest were Jack Haller, Allied Chemical Corp., and Jim Rodgers, Union Carbide & Carbon Co. The hole-in-one tournament was won by John Snyder, Columbian Carbon Co., and Bob Kirwin, Globe Woven Belting Co.

IRC Abstracts on Testing, Theory, Etc.; Early Registration Urged

Additional abstracts of papers to be presented at the International Rubber Conference in Washington, D. C., November 9-13,[1] are presented herewith. About 20 of the 75 abstracts were published in our July issue, and these additional 17 cover sessions on testing, compound classification, statistics, and rubber theory. The presentation of these abstracts will continue in future issues.

As mentioned last month, preprints of the complete papers will be prepared for distribution at the time of registration for the Conference in November, and the registration fee includes the cost of the book of preprints. Some additional copies of this preprint book will also be available for sale during and after the Conference.

The local committee for the Conference sent out advance registration and hotel reservation forms in May and all those interested in attending the Conference are urged to send in promptly their advance registration and hotel reservation forms.

The local committee on arrangements for the Conference is headed by Arthur W. Sloan, Atlantic Research Corp.; other members and their responsibilities follow: H. C. Bugbee, Natural Rubber Bureau, transportation and plant trips; E. A. Bukzin, Navy Department, Bureau of Ships, registration; George W. Flanagan, B. F. Goodrich Co., finance; W. J. Sears, Rubber Manufacturers Association, banquet; R. F. Tener, National Bureau of Standards, housing and meeting rooms; George B. Krantz, American Chemical Society, publicity; Charles R. Collins, Goodrich, ladies' entertainment; Norman Bekkedahl, NBS, consultant and testing machines exhibit; and R. D. Stiehler, NBS, consultant.

Additional details of the Conference program will be reported as they become available.

International Rubber Conference Program *(Continued)*

Session No. 4—Wednesday Morning November 11

Advances in Tesf Methods

22. Micro-Hardness and Micro-Rebound Measurements. S. Oberto (to be presented by a colleague), Pirelli Rubber Laboratories, Milan, Italy.

Small-scale testing can be very valuable for use on vulcanizate samples cut from finished articles. The small size, however, imposes severe problems in regard to accuracy of both machines and methods. This paper describes two pieces of equipment and methods for their use for the micro-determination of hardness and elastic rebound.

Micro-hardness has been possible previously by the use of a "microdurometer" which could determine ISO[2] rubber hardness on samples with thicknesses as low as one mm. This paper gives the development of a "picodurometer" with an indentor of approximately 0.2-mm. diameter and weight of about 0.10 g. This indentor is activated electromagnetically, and the readings are made by an optical interference method. Use of the "picodurometer" is somewhat more elaborate than the compact "microdurometer," but it is capable of measuring the hardness of samples of a few cubic millimeters. It will measure the hardness of rubber in sections of rubberized fabric and can be used to detect surface hardening due to light or other treatments.

The second apparatus described is a "microrebound" tester. Reasons for the development of this machine include the test of thinner samples, and, also of great importance, the fact that it will approach conditions in which reduction of parasitic energy losses increases the accuracy. The apparatus is a pendulum type with a mass of 80 g. and an impact speed of 0.05-m./s.; it is electromagnetically released, and its rebound is read by means of the persistent luminescence of a phosphor covered screen. Samples as thin as 1.5 mm. are held in place by suction and tested under controlled temperature conditions. Results show very good correlation with other pendulum methods.

23. Micro-Hardness Testing—Its Possibilities and Limitations. A. L. Soden and J. R. Scott, Research Association of British Rubber Manufacturers, Shawbury, England.

The need to test small awkwardly shaped rubber articles, which cannot be tested by normal methods, has led to the development of a scaled-down "micro" test for hardness. Attention is drawn to the mechanical problems that arise in devising such a micro test, especially those associated with friction in the moving parts and with the measurement of the very small movements of the indentor. The various ways in which these problems have been solved are described. The results of experimental work are presented to show the equivalence in readings between the micro and the normal (macro) test, the reproducibility of micro test results, the influence of test-piece dimensions, and the use of a foot on the instrument as specified in ISO Recommendation R.48 for the normal hardness test.

Attention is drawn in particular to the influence of the dimensions of the rubber tested and the limitations which this imposes on obtaining results agreeing strictly with those of the macro test.

24. New Artificial Weathering Methods. G. F. Bush, G. F. Bush Associates, Princeton, N. J.

After a brief introductory discussion of the general weathering effect at the earth's surface on every-day materials, including rubber and rubber-like materials, the basic requirements of an idealized artificial weathering method are discussed in detail in terms of parameters of sunlight, moisture (including rain), temperature, gases, magnetism, radiation, dust, and wind. The practical realization of a method introduces a great variety of essential topics, most of which are discussed in detail under "Concepts," "Parameter Limitations," "Apparatus," and "Evaluation."

Included among these topics is new information on the following: (1) Comparison of the concepts of total exposure and total time of exposure; the latter includes false assumptions of constant rates of the parameter (irradiation, concentrations, voltage supply, etc.), and this introduces serious errors; while the former concept accommodates even widely variable rates without error. (2) Reliability or reproducibility. (3) Air moisture as a new function of sunshine and temperature. (4) Effects of rain, gases, radiation, and dust. (5) New improvements related to basic parameters, in synthetic sunlight spectral distribution, accurate control of preset humidity, preset exposure patterns including day-night sequences; and various rain-dry programs. (6) Effects of various parameter groups, with and without controlled humidity, rain, etc. (7) Weathering evaluation, subjective and objective, by various types of instruments, standard sets of samples and photos, etc.; the new Fractional Fading rule. (8) Essentials of available apparatus for general and specific uses, including artificial sunlight sources. (9) Brief discussion of standard domestic and foreign lightfastness tests including the 1958 ISO Recommendation.

Basic references in the bibliography include 56 since 1955, some as private communications from abroad.

25. The Natural and Accelerated Ozone Aging of Elastomer Compounds. M. M. Lowman, Goodyear Tire & Rubber Co., St. Marys, O., and H. P. Miller, B. F. Goodrich Co., Cadillac, Mich.

After World War II it became apparent that cracking due to ozone attack was taking an unusual toll on elastomeric products. The reasons for this sudden serious appearance would make pages of interesting study and comments and may have been both physical and psychological. This paper, however, deals with the actions taken by users and vendors, together in ASTM[3] and

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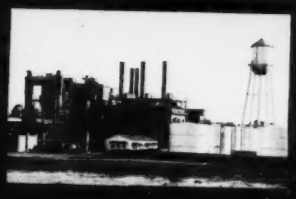
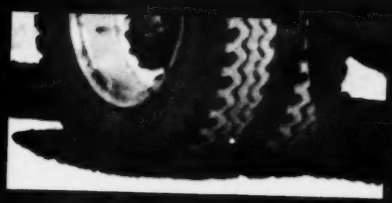
[1] RUBBER WORLD, July, 1959, p. 579.
[2] International Standards Organization, Geneva, Switzerland.
[3] American Society for Testing Materials, Philadelphia, Pa.

From here 

to here 

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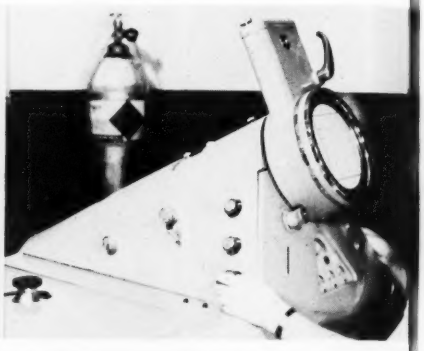

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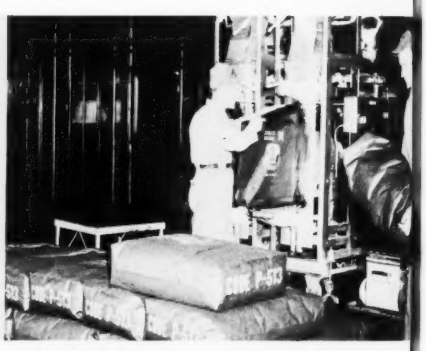

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MICRONEX W-6 EPC Easy Processing Channel
STATEX®-B FF Fine Furnace
STATEX-M FEF Fast Extruding Furnace
STATEX-93 HMF High Modulus Furnace
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SAE[4] committees, to develop testing standards whereby the resistance of elastomer compounds to ozone could be evaluated.

Since the failures occurred outdoors, the first tests were outdoor exposures. Standard dimensions of the sample and standard mounting mandrels were developed to insure uniform strain on the sample. The handling of the samples in the unvulcanized and vulcanized state and the method of exposure were developed. A rating system was developed using 2X photographs for standards. A quality retention system was developed. The results of outdoor exposure in various places in the United States are given.

An effort was made to accelerate this cracking in an ozone chamber. The results were not reproducible between laboratories. It is shown where much closer agreement between laboratories is now being reached than at the start of the program. This is due to higher air velocity through the chambers, a better realization of the importance of the time on the mandrel before testing, the effects of crystallization of the samples, proper handling of the sample during aging on the mandrel before exposure, and clarification of the rating standards and their method of use.

Considerable progress has been made in the last ten years. Methods have been established for determining natural and accelerated ozone resistance of elastomer vulcanizates. We would like to improve these. There is a need for a correlation of natural ozone aging with accelerated ozone aging. For this we need a standard unchanging weather.

26. Viscosity and Relaxation Measurements on Crude Rubbers and Compounds. S. Eccher, Pirelli Rubber Laboratories.

A parallel-plate shearing viscometer has been developed and constructed, where friction effects have been almost completely avoided with the use of a symmetrical sample and where the displacements of the movable plate are optically followed by a device which may read to 0.1 μm. This instrument is therefore very suitable for viscosity measurements at very low shear stresses, down to N/m^2 (10^3 dyne/cm^2).

A similar parallel-plate device equipped for shear-stress measurements has also been constructed; the forces are measured by a strain gage transducer, and an electric integrator gives the time integral of the stress, which may be compared to viscosity. The instrument is used to measure the shear-stress relaxation following an instantaneous step of shear strain.

These two instruments have been used on experimental work on raw natural and synthetic rubber and their mixtures with various fillers and softeners at different mastications and temperatures.

Lower limit viscosities were attained where behavior of materials has been found to be substantially Newtonian. Time integral of stress and limit viscosity give interesting information as to behavior of crude materials during plastic deformation which may take place during processing and in subsequent free recovery.

27. Aging of Rubber Vulcanizates. J. Mandel, F. L. Roth, M. N. Steel, and R. D. Stiehler, NBS, Washington, D. C.

An analysis of aging data in the literature and of measurements made at the National Bureau of Standards indicates that elongation at failure is the best of the tensile properties for characterizing the deterioration of rubber vulcanizates during storage at various temperatures. Elongation at failure decreases during aging for all types of rubber vulcanizates; whereas tensile strength and modulus may increase, decrease, or remain essentially unchanged. During most of the useful life of a rubber vulcanizate, ultimate elongation decreases approximately linearly with the square root of time. The square root relation can be used to predict a minimum life for the rubber vulcanizate since the decrease in elongation after long periods of aging becomes less than would be inferred from this relation. Measurements of ultimate elongation at two or more elevated temperatures makes possible an estimation of shelf life at room temperature.

28. The Charles Goodyear Medal Lecture of the Division of Rubber Chemistry, American Chemical Society. "People and the Banbury Mixer." Fernley H. Banbury.

Session No. 5—Wednesday Afternoon November 11

Test Methods

29. Standards for Rubber Compounding. F. L. Roth and R. D. Stiehler, NBS.

The National Bureau of Standards has established 17 standard samples of ingredients used in rubber compounding, including three standard rubbers. This paper describes the procedures used for sampling and evaluating these standards. Some of the problems encountered in establishing them are presented.

30. Sulfur Group Analysis in Natural Rubber Vulcanizates. M. L. Studebaker and L. G. Nabors, Phillips Chemical Co., Akron, O.

Our ideas on the nature of the cross-links in sulfur-cured vulcanizates are largely based on the following types of information: (1) studies on model systems, (2) analyses for allyl sulfide by removal with methyl iodide, (3) stress relaxation as a function of temperature, (4) combined sulfur coupled with total cross-links from swelling or modulus data, and (5) isotope exchange using S^{35}. This information generally indicates that the cross-links are composed of mono-, di-, and polysulfide linkages. To obtain additional insight into this problem, we have employed the very reactive reducing agent, lithium aluminum hydride.

In this paper data will be presented on some natural rubber gum and HAF-loaded compounds, containing 3 phr sulfur and 1 phr of three different accelerators. TMTD[5] (sulfurless) cures will also be included. After extraction with chloroform and treatment with a 50:50 mixture of ether and concentrated hydrochloric acid followed by extraction with methanol, vacuum drying and swelling in dioxane, the samples were treated with lithium aluminum hydride, and the quantities of sulfide sulfur and mercaptan formed were determined by potentiometric titration.

When coupled with other analyses, these results provide useful information on the nature of the cross-links.

31. The Stress-Strain Behavior of Elastomers at Different Velocities of Deformation. G. Fromandi, R. Ecker, and W. Heideman, Farbenfabriken Bayer, A.G., Leverkusen, Germany.

In the mechanical-technological testing for the evaluation and control of elastomers the one-point test is mostly sufficient, particularly when the mechanical, physical, and chemical values are already established by a comprehensive range of testing. This procedure is insufficient, however, for classifying new elastomers being developed in relation to existing materials. For this purpose it is necessary to carry out testing on a large scale under a wide range of testing conditions.

The most important parameters in the testing of elastomers are the following: the mechanical prestressing of the test specimen, the testing temperature, and the rate of deformation. The first two parameters have been dealt with in previous papers. The present paper deals with the influence of the rate of deformation during the static tensile test.

An apparatus has been designed to measure the rate of deformation which is fitted with a device to exert the required force on the test specimens. The forces which cause deformation and the measure of deformation are transmitted by means of an electronic transmitter to an oscillograph and recorded by a camera. This apparatus will be described in full.

Preliminary test results obtained on various elastomers are reported in graph form.

Classification

32. A Practical Method of Classifying All Elastomeric Vulcanizates. N. L. Catton, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., R. C.

[4]Society of Automotive Engineers, New York, N. Y.

[5]Tetramethyl thiuram disulfide.

Aerial view of Sheraton-Park Hotel, Washington, D. C., where IRC banquet will be held on Thursday, November 12

Edwards, Chrysler Engineering Corp., Detroit, Mich., and T. M. Loring, Michigan Precision Molded, Inc., Walled Lake, Mich.

The paper will present a discussion of a new system of coding and classifying *all* elastomeric vulcanizates. The complex problems facing the rubber and automotive industries dictated the need of an improved system that would be flexible enough to satisfy today's needs and provide for tomorrow's requirements. The importance of retaining the nomenclature advantages and experience gained with ASTM D 735 is recognized. Any system to be acceptable must be flexible enough to accommodate new elastomers, additional test requirements, and new methods of test; must supply guidance to the user in the selection of practical commercial compositions and restrict the inexperienced from specifying impossible and impractical combinations of physical properties. The resulting "Expanded Tabular System" provides a satisfactory answer to these needs.

The system provides a simple and flexible method of calling out various qualities and grades of elastomeric vulcanizates, based upon physical properties determined by specified standard methods of test. The proposed system is a single tabular presentation of values obtainable in practical commercial compositions. The nomenclature will provide for easy and practical call-out of quality and test conditions.

The use of the system and its applicability to all branches of the rubber industry is considered. The flexibility and simplicity of the "Expanded Tabular System" will be stressed, as will the need of a uniform worldwide acceptable classification and coding system. The advantages of the system will be discussed, and it will be shown how the proposed system could be used on an international basis. The format is flexible enough to permit the use of either the British standard units or metric system units; and, if desirable, a master table could be prepared containing both units of measurement.

Statistical Methods

33. The Use of Regression Techniques in Elastomer Compounding. P. F. Bertsch, Du Pont.

Several properties of elastomer compositions, such as scorch resistance of the mixed compound and stress-strain characteristics of the vulcanizate, are described as continuous mathematical functions of the ingredients and curing conditions. The specific relations used are derived empirically from a small number of data points. Precise mathematical descriptions are developed from more complete data with the application of regression techniques. Statistical testing is then used to evaluate the adequacy of the relations (or mathematical models) to fit all the data. When an empirically selected mathematical model is judged inadequate by the statistical test, it is discarded, and another more appropriate one chosen.

This technique is applied to the complex problem of predicting the heat resistance of an elastomer at various elevated temperatures. This work shows the correlation between the compression set of unaged samples and the tensile strength or elongation of aged samples. Mathematical models are developed to describe these relations more precisely because of their potential usefulness in assessing heat resistance without actually aging and testing.

The successful use of the regression techniques depends upon a judicious choice of experimental points, a thorough study of the data generated, and the liberal use of a digital computer to perform the numerous and tedious calculations. These items are discussed in some detail.

The practical value of this approach includes: (a) the ability to look at properties as they are simultaneously affected by changes in two, three, or more variables, permitting an overall rather than piecemeal treatment of a problem; (b) the large output of information *versus* the number of experiments—an efficiency which thrives on a high number of variables; and (c) the versatility inherent in working with mathematics, permitting, for example, the calculation of maxima, minima, restricted maxima, etc.

34. Modern Quality Control. S. Collier, Johns-Manville Corp., New York, N. Y.

We are all aware that since World War II we have witnessed a steady increase in prices. During the transition period from war to peace-time production, when supply could not meet demand, there was no comparable increase in quality for the increase in price. When we changed from a seller's to a buyer's market, however, the picture rapidly changed. Customers became quality conscious and have continually demanded better product quality for their inflated dollar.

Manufacturing costs have risen similarly owing to increased costs of raw materials, labor, taxes, etc., and in order to have a satisfactory profit, it has been necessary for management to utilize every means possible to keep costs down. It seems to be a paradox that we are expected to improve quality of our products, but at the same time to reduce the costs of quality control and inspection. There have been several means by which this aim has been accomplished: (1) by installation of incentive plans, (2) by automation of the process, (3) by application of various statistical techniques, and (4) by direct appeal to the workmen to do a better quality job. The quality control department has been most concerned with the last two as they are part of our direct responsibility.

The two most common statistical techniques are process control charts and sampling plans, outlined in the Johns-Manville color film, "Modern Quality Control." The film is used for the training and education of our personnel in these techniques.

Perhaps the most important of any of the approaches is that of appeal to the workman to produce quality goods. There must be a feeling of quality consciousness throughout the organization, or the other approaches will fall short of their objectives. The spirit of quality consciousness, while present in

every organization, needs stimulation if it is to flourish. To achieve this, we need the help and the cooperation of all members of the organization from top management to the production worker. There must be a continual training and educational program to bring to the attention of all concerned the importance of quality. Meetings, films, posters, and exhibits all aid in keeping the spark alive.

Many case histories can be cited featuring the success of these various approaches, and such are in existence for all types of industry. Since your interests are primarily concerned with the rubber industry, we have a very good basic application demonstrating both process control and worker cooperation which resulted in marked improvement in quality and also appreciable savings.

Session No. 6—Wednesday Afternoon November 11

Theory

35. Measurement and Interpretation of the Rate of Volume Swell and Equilibrium Volume Swell in Cross-Linked Networks. D. J. Buckley and M. Berger, Esso Research, Linden, N. J.

The swelling method involving the amount of solvent imbibed by a cross-linked network at equilibrium has been used extensively for numerous purposes. This method has been used to determine interaction coefficients, molecular weights of chains between cross-links, and to study the cross-linking process and the nature of reinforcement. The standard method consists of allowing a sample to swell to equilibrium in some solvent and then determine the amount of solvent imbibed gravimetrically.

An optical method is described which not only greatly simplifies obtaining data at equilibrium, but also allows taking of data during the dynamic process of swelling. The method consists of interposing a sample of elastomer in a glass cell containing a particular solvent in the path of a light beam. The light which is not intercepted by the sample passes through a lens system into a phototube. The output of the phototube is recorded. As the sample imbibes solvent, its increase of area intercepts more light, resulting in changes in the phototube output. Samples are found to swell isotropically, and thus area increase can be converted to volume increase. Experimental considerations and limitations are discussed along with representative curves of the complete swelling history of vulcanizates up to and including equilibrium. These vulcanizates are considered with respect to the cross-link density achieved by a number of vulcanizing systems. Carbon black and mineral pigment compositions are analyzed relative to the nature of reinforcement. A number of solvents are employed which represent a range of interaction coefficients for the polymers under study. The swelling process is discussed as a diffusion problem wherein the diffusion coefficient is concentration dependent.

36. Longitudinal Tearing of Vulcanizates in Extension—II. Tests of Various Elastomers in a Limited Range of Temperature and Speed. R. Chasset and P. Thirion, Institut Français de Caoutchouc, Paris, France.

In a previous article the authors described a method of measuring longitudinal tear resistance of stretched rubber. By this means the instantaneous transverse force is determined which is required to initiate—with the aid of two metal loops arranged at the top of the cut—a longitudinal tear in a partially split sample ("trouser" type) subjected to static extension.

This test was conducted on various elastomers in order to explain the effects of the fibrous structures frequently involved when the only force applied to the sample is the tearing force itself. Examined were: natural rubber, cold styrene-butadiene rubber (Krylene),[6] Neoprene W,[7] a butyl rubber (Polysar 301),[6] and a nitrile rubber (Hycar 1042),[8] either as pure gum compounds or as reinforced compounds (MPC, ISAF blacks; Hi-Sil 233,[9] colloidal silica).

In the range of temperatures (20 to 60° C.) and speed (separation of loops 5 cm./min.) studied, longitudinal tearing of natural rubber vulcanizates presents peculiar characteristics, as compared with that of the synthetic rubbers tested. The manner of tearing and the level of the critical force at the instant when tear growth begins, in particular, are much more influenced by the amount of static elongation the sample has undergone. Thus in natural rubber with elongation under 70-80%, tearing is seen to occur suddenly as if the fibers ruptured perpendicularly to their axis; whereas above 140% elongation, tearing progresses slowly as though the fibers separated laterally. On the other hand, in synthetic rubbers tearing is related to a process of plastic flowing, whatever the elongation of the sample may be. Finally, it was noted that the way in which reinforced compounds tear, when vulcanized with a peroxide, is distinctly different from those vulcanized with sulfur and an accelerator.

At present it is difficult to interpret the overall results obtained. Crystallization, however, does not seem to play a decisive part in the fibrous tearing of natural rubber, indeed: (1) at 60° C., neither the tearing behavior of natural rubber nor the levels of critical force differ much from those observed at 20° C.; (2) elastomers capable also of crystallizing by stretching, like neoprene or butyl rubber, show the same amorphous tearing characteristics as a non-crystallizable elastomer like SBR.

With the reservation of verification based on other rheological properties, optical or electrical, of reinforced vulcanizates, the preceding tearing methods suggest the following hypothesis respecting the nature of the structure liable for the improvement of their tear resistance.

The constituent elements of the fibers might be agglomerates of filler particles including little rubber; the differences observed in accordance with the nature of the elastomer could then be due to the rheological behavior of the agglomerates, being more elastic in natural rubber mixes and more plastic in synthetic rubber mixes.

37. The Measurement of Flow and Slip Velocity with the Shearing Disk Viscometer. M. Mooney, United States Rubber Co., Wayne, N. J.

If a Mooney shearing disk viscometer is fitted with a multi-speed drive and an extra rotor with a smooth surface, it is possible to compute from experimental data both the rate of shear of the test material and its velocity of slip on the smooth rotor surface, each as a function of the shear stress.

The rheometric theory for the computations assumes that the exact flow and slip functions can be adequately approximated by power expressions of the form $g = f\tau^n$, and $v = s\tau^p$, where g is the rate of shear, v the slip velocity, τ is the shearing stress, and f, n, s, and p are material constants. The constants s and p are characteristic not of the test material alone, but of the combination of the test material and the rotor surface. A graphical procedure for obtaining the flow curve has been devised. An illustrative curve shows the slip velocity of pale crepe on a Teflon[7]-coated smooth rotor at 100° C.

38. Response of an Elastomer to Any Forcing Function. M. Berger, Esso Research.

It is well established that if the response of a system to a step function is known, then the system's response to any forcing function can be predicted. If the system is linear, then Borel's or the convolution integral can be used. For non-linear systems, other techniques must be employed.

In this work these principles are used for the study of the mechanical behavior of elastomers. A device for applying a step function in stress and detecting the strain response has been designed. From the results of a single experiment with this equipment, it is possible to calculate the response of the elastomer over a wide frequency range. In addition, the response of the elastomer to any selected stress, such as may be characteristic of a service application, can be found. Typical results for vulcanizates of butyl, SBR, and natu-

[6]Polymer Corp., Ltd., Sarnia, Ont., Canada.
[7]E. I. du Pont de Nemours & Co., Inc. Wilmington, Del.
[8]B. F. Goodrich Chemical Co., Cleveland, O.
[9]Columbia-Southern Chemical Corp., Pittsburgh, Pa.

Reprints Available

Reprints of the June, 1959, article, "Available Dry Styrene Rubbers (SBR)—United States and Canada," by R. G. Seaman and C. A. Carlton, including tables of the 150 different SBR's now on the market, may be obtained at a cost of 30¢ each from RUBBER WORLD, 630 Third Ave., New York 17, N. Y.

ral rubber are discussed. This technique permits a characteriaztion of dynamic properties over a wide frequency range. Since the method also provides a prediction of response to selected types of stresses, it is apparent that it is an excellent tool for applicational research on elastomers.

The method discussed up to this point is based on an assumption of linearity in the elastomeric dynamic system. A further detailed technique, involving use of an analog computer, has no restrictions relative to nonlinearities. In essence, an analog is built up such that the response of the analog to a step function is the same as the response of an elastomer. The components of the analog bear a direct relation to the components of the elastomer which contribute to dynamic behavior. This approach, in addition to providing response information, gives insight into the nature of the viscoelastic behavior of polymers.

39. Some Statistical Considerations Underlying Molecular Theories of Rubber Elasticity. Jacob Mazur and Turner Alfrey, Jr., Dow Chemical Co., Midland, Mich.

This paper does not introduce a new molecular theory of rubber elasticity, but rather develops some previously unnoticed statistical considerations basic to any such theory.

A real vulcanized rubber network is a topologically complex structure, consisting of a series of mesh-points connected by flexible chains. The configurational changes on the molecular level which accompany a macroscopic elastic deformation are subject to certain strong restrictions, e.g., preservation of the topology of the network. Consequently the individual chains of the network are far from being independent statistical elements.

Such a real network can be partially simulated by various idealized networks consisting of independent chains connected into simple topological structures. Each individual chain is then characterized by a chain-end distribution function, w(r), which not only reflects the internal structure of the chain, but also simulates in some way the effects of the network restrictions.

The first part of this paper deals with one-dimensional model systems: various series-parallel arrangements of "independent" chains, and a wide range of chain-end distributions, w(x), are analyzed. A probability function, W(X), is derived for the vectorial separation between *terminal* mesh-points of the network. Next, $\overline{X}$ is constrained to a fixed value, and a conditioned probability function, $P_{\overline{x}}(x)$, is derived for the individual chains in a deformed network. It is possible to draw rigorous conclusions concerning the conditions required for an affine transformation of network points, or for a shift of distribution function without broadening, etc.

The above treatment is extended to two dimensional arrays of chains and mesh-points, using the more tractable forms for w(r). In the case where the distribution functions for the individual chains are displaced Gaussian functions, a mathematical analogy is developed which permits network of flexible chains to be replaced by an "equivalent" electrical network.

(To be continued)

IRC Exhibit to Include Products, Materials

Late in July the IRC Committee decided that the exhibit of testing equipment planned for the Conference would be extended to include exhibits of rubber and chemicals used, processing machinery and equipment, and rubber products. Interested exhibitors should contact Norman Bekkedahl, Exhibit Chairman, National Bureau of Standards, Washington 25, D. C.

CALENDAR of COMING EVENTS

June 15-September 4
Gordon Research Conferences. Colby Junior College, New London, N. H.; New Hampton School, New Hampton, N. H.; Kimball Union Academy, Meriden, N. H.

August 21
Philadelphia Rubber Group. Golf Outing. Manufacturers Golf & Country Club.

September 12
Connecticut Rubber Group. Outing. Grassy Hill Park, Ansonia, Conn.
Northern California Rubber Group. Outing. Turtle Rock Ranch, near Danville, Calif.

September 24
Fort Wayne Rubber & Plastics Group.

October 2
Detroit Rubber & Plastics Group, Inc. Detroit Leland Hotel, Detroit, Mich.
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

October 6
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

October 8
Southern Ohio Rubber Group. Gibbons Hotel, Dayton, O.

October 9-10
Southern Rubber Group. Hotel Peabody, Memphis, Tenn.

October 13
Buffalo Rubber Group. Hotel Westbrook, Buffalo, N. Y.

October 16
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Hotel Somerset, Boston, Mass.

October 19-21
Ninth Canadian High Polymer Forum. Guild Inn, Toronto, Ont., Canada.

October 23
Akron Rubber Group. Sheraton Hotel, Akron, O.

October 26-31
International Standards Organization Technical Committee 45 on Rubber. Henry Hudson Hotel, New York N. Y.

November 5
Rhode Island Rubber Club. Fall Meeting. Pawtucket Country Club, Pawtucket, R. I.

November 6
Philadelphia Rubber Group. Fall Dance. Manufacturers Golf & Country Club.
Connecticut Rubber Group.

November 9-13
International Rubber Conference. Division of Rubber Chemistry, ACS; Committee D-11, ASTM; Rubber & Plastics Division, ASME. Shoreham Hotel, Washington, D. C.

November 29-December 4
American Society of Mechanical Engineers. Annual Meeting. Chalfonte-Haddon Hall, Atlantic City, N. J.

Head table at RMA Molded and Extruded Goods Subdivision meeting banquet. Inset shows Walter J. Blizzard *(right)* receiving an outstanding service award from Ross R. Ormsby

Sales Problems Discussed by RMA Molded, Extruded, Sponge Subdivision

The mountain setting of The Homestead, Hot Springs, Va., was the locale of the annual meeting of the Molded, Extruded, Lathe-Cut & Chemically Blown Sponge Subdivision of The Rubber Manufacturers Association, Inc., on June 25, 26, 27. In spite of some rather sudden showers which caught golfers and diners unprepared on occasion, the meeting was well attended, with registration at an all-time high, and considered very successful. Theme of the meeting was "Blueprints for Better Sales Management." Major points for discussion were methods and amounts of compensation for salesmen. Added ideas presented were on political activity of management, a report on the impact of imports on the Subdivision's sales, the economic outlook for the next year and beyond, and a general covering of the missile program of the country, with some specific ideas on rubber procurement for this program.

Presiding at the meeting was Walter J. Blizzard, Firestone Industrial Products Co., who is chairman of the Subdivision and who was assisted by the new secretary of the group, Edward Welch, of the RMA.

Political Activity Urged

The first business session was held on Thursday morning, and the first speaker following Mr. Blizzard's welcome was W. James Sears, RMA, who discussed "Political Responsibilities of Management." Mr. Sears reported as chairman of the newly created Public Affairs Committee and suggested that politics was a personal thing to everyone and that in most cases industry activity had to be individual since there was no "expert" on the payroll to advise on politics.

The government is in every phase of business activity, however, so that politics is of vital interest to the businessman.

The current trend, according to Sears, is for politicians to support the belief held by many people in the country in feeling that business management could be improved by greater participation by labor and government. He said that business must follow the lead of the labor unions in providing political workers. Of the 475,000 labor leaders, 300,000 are full-time professionals and spend about 85% of this time on political activity. He concluded that management must speak up and make itself heard, to present the case for business to the people and to the Congress, and to reverse the trend toward the labor-oriented Congress now in progress.

Group Dynamic Forum

The second phase of the workshop session was led by Dr. Kenneth B. Haas, Hofstra College, who presented the idea of group dynamics for solving problems to those in attendance. Dividing the members up into groups of eight and requiring audience participation, Dr. Haas showed how the introduction of many ideas in a conference could produce the several ideas which could solve a problem. The total years of rubber industry experience of the group participating was determined and found to average almost 20 years, with individuals ranging with as high as 40 years of experience. Dr. Haas suggested that there should be sufficient knowledge obtained in those years to solve the problems presented by the members, and through workshop sessions he proceeded to promote ideas for such solutions. Comments on the method were very favorable.

"Salesmen's Compensation and Expense" was put through a quite complete and searching discussion by a panel moderated by Howard W. Smith, Pawling Rubber Corp. Members of the panel included H. M. Dyer, Acushnet Process Co.; E. F. Callanan, Clevite Harris Products, Inc.; R. H. Davis, Cooper Tire & Rubber Co.; R. G. Cox, B. F. Goodrich Co.; L. R. Jacobs, Premier Rubber Mfg. Co.; and H. C. Dinmore, Tyer Rubber Co. Several of the panel members presented prepared talks on the Thursday morning program concerning the various methods of compensation such as straight salary, salary plus commission, salary plus bonus, or straight commission. Questions were collected, screened by the panel, and answered during a session on Friday morning.

A report on the problems of "Meeting the Challenge of Imports" was distributed in the absence of the author, C. C. Miller, RMA, who could not attend. In his report, Miller reviewed the entire history of the import problem. Included in this history was the part played by government agencies, past and present, and some of the objectives being sought by these agencies. He stated that rubber goods are among those being imported and advised methods of recourse to anyone who believes they are being hurt by such imports. A suggested list of 11 possible safeguards was presented, and each explained during the course of the talk.

Business Outlook

The "Economic Outlook — 1959-1960" was the subject of a talk by James A. Livingston, Financial Editor & Economist, *Philadelphia Bulletin*. The general tone of his talk was that business should be good during the next year and a half, and life should be pleasant and productive. He felt it was his duty, however, to warn against overconfidence. He suggested that when business is good, there is a tendency to push too far and too fast. It was suggested that a little common sense now will spare much anguish later, and that the boom can be prolonged by curbing ourselves and it now.

The final portion of the formal program was occupied by Commander Robert J. Gutheim, Defense Department, who has been active in the missile program. His talk concerned the guided missile program, and he discussed missiles in development or production. Included in his presentation was a film of shots taken at missile bases, but cleared for security, with commentary provided by Commander Gutheim. He emphasized the future role of the molded and extruded goods industry in the missile program and suggested that the companies keep up with developments in the field.

Another view of banquet during RMA Molded Subdivision meeting

Annual Dinner

The annual dinner of the subdivision was held on Thursday evening. The only business item during the dinner was the presentation of an award to Mr. Blizzard by Ross R. Ormsby, RMA president, for his service to the Subdivision during his chairmanship and particularly during the period when the subdivision was without a secretary.

Other Divisions Meet

A new Glove Subdivision was organized at the annual meeting of the Sundries Division of the RMA held at The Greenbrier, White Sulfur Springs, W. Va., June 25-27. Manufacturers of rubber gloves including household, surgeons, and industrial types who are members of the RMA will make up the new Subdivision which will continue as part of the Sundries Division. This Subdivision will have its own executive committee, however, to direct its affairs and plan its separate meetings. Elected to this committee for one year were R. W. Nickels, Faultless Rubber Co., chairman; John R. Jones, Pioneer Rubber Co.; and John W. Simmons, Wilson Rubber Co.

Sundries Division

During the meeting of the parent Sundries Division the following were elected to the executive committee for a one-year term: Joseph Anastasio, United States Rubber Co., Richard A. Lord, B. F. Goodrich Co., C. R. Porthouse, Pyramid Rubber Co., and John W. Simmons, Wilson Rubber Co.

Karl O. Nygaard, Goodrich, was principal speaker at the meeting. He reviewed the general economic situation and discussed various phases of the sundries industry. A major problem, according to Mr. Nygaard, is the growing rate of importance of competitive products in this industry.

A panel discussion on the topic, "Advertising and Sales Promotion," was also a feature of the program with Mr. Anastasio, Mr. Lord, and C. W. Wyer, A. W. Faber-Castell Pencil Co., as panelists. J. D. Horne, Eberhard-Faber Pencil Co., served as moderator of the panel.

Footwear Division

The annual meeting of the Footwear Division of RMA, held June 17-19 at Wianno Club, Wianno, Cape Cod, Mass., also featured the election of the executive committee. W. E. Brimer, Tyer Rubber Co., J. C. MacKinnon, B. F. Goodrich Footwear & Flooring Co., and C. W. Pennington, U. S. Rubber Co., were elected to serve on the three-man committee.

The major topic for discussion at the meeting concerned the problem of the effect of imports. The discussion included all general products and their effect as well as rubber footwear and its specific problems.

Flooring Division

A major action of the Flooring Division of RMA at its June meeting held at the Seaview Country Club, Absecon, N. J., was the adoption of a program for registering trade names with the RMA. Members will list names currently in use and will file any new names introduced in the future. Purpose of the listing, which is strictly an information service, is to help avoid duplication or introducing names similar to others in use which might cause confusion.

1,150 Enjoy Akron Group Outing

The annual outing of the Akron Rubber Group was held on June 19 with more than 1,150 members and guests in attendance. The affair took place at the Firestone Country Club in Akron, O., where 295 engaged in the golf tournament, and 225 participated in the decathlon contest. For those not indulging in the active sports the 19th hole was open during the day, and a dinner under the big top concluded the day's events. About 500 door prizes were distributed at dinner.

General Tire photo

Nick Marcu *(left)*, receiving his trophy for winning the decathlon event at Akron RG outing from Group Chairman George Hackim *(right)*, with Chairman-Elect Milton Leonard *(center)* looking on

General chairman for the event was R. R. Hickernell. F. W. Burger headed the prize committee; Mike Gobush was chairman of the golf committee; Maynard Bobbitt, the decathlon contest; and L. V. Cooper arranged the food and location.

Golf tournament winners were: low gross—J. Cseh, longest drive—V. Musser, nearest the pin—A. Pedrosa and H. Miller, and an 18-way tie for honors in the blind bogie category. The decathlon contest was won by N. Marcu, with E. Reinhold in second place, and T. Kennedy in third.

Cable Symposium

The eighth annual wire and cable symposium, sponsored by the U. S. Army Signal Research & Development Laboratory, will be held on December 1-3, at the Berkeley-Carteret Hotel, Asbury Park, N. J.

As in the past, some 25 technical papers will be presented showing the progress during the preceding year in the field of communications wires and cables. Heading the symposium committee this year is Howard F. X. Kingsley, of USASRDL.

Also on the committee are F. W. Wills, of USASRDL; Ray Blain, USA Signal Engineering Agency; C. T. Wyman, Bell Telephone Laboratories; J. L. Robb, Superior Cable Corp.; Benjamin Levinson, The Okonite Co.; I. T. Stoneback, I. T. & T. Laboratories, and H. L. Wuerth, B. F. Goodrich Chemical Co.

O'Keefe Discusses SBR Marketing Problems during the Next Decade

"The Challenge of Marketing Rubber in the Coming Decade" was the subject of a talk by A. K. O'Keefe, president, Texas-U. S. Chemical Co., before the chemical marketing group of the New York local section of the American Chemical Society on June 3.

Mr. O'Keefe mentioned first the marketing of natural rubber which is done mostly by rubber importers and is based on about 30 different grades under nine major classifications as developed by The Rubber Manufacturers Association, Inc., and the Rubber Trade Association of New York and endorsed by more than 20 other rubber trading and marketing organizations throughout the world. He pointed out that these importers, with limited staffs, are unable to offer the technical service provided by the chemical, plastic, and synthetic rubber industries today.

The area of marketing the large volume, general-purpose styrene-butadiene rubbers was the major subject of Mr. O'Keefe's talk. He mentioned how the pattern of technical selling of specialty synthetic rubbers such as the neoprenes and nitriles had provided an excellent model for the marketing of SBR, after private industry purchased the government-owned facilities in April, 1955. Whereas, under government operation, little technical service was offered the consumer, immediately after takeover private industry began to set up extensive laboratories, skilled teams of laboratory technicians, and experienced technical field forces.

The magnitude of the SBR salesman's job was explained in terms of the 40,000 different rubber products made by the fabricating industry with 1,600 companies located in more than 750 different cities. In addition, while the government produced about 40 different solid rubber types, a recent tabulation (RUBBER WORLD, June, 1959) showed a total of more than 150 types at the present time.

The problems confronting the SBR marketing team were summarized as:

1. A rapidly expanding technology which has created an unusually large number of competitive polymer types and packages.

2. Greatly increased selling costs, due not only to the number of rubber types, but to sales promotion expenses and distribution costs.

3. An enlarged and growing rubber industry requiring not only more companies to be contacted, but more persons to be sold in each company.

4. The unique needs of foreign consumers and the very special requirements of getting American SBR technology into their hands.

5. The need of closer liaison between the producer's and the consumer's technical personnel to understand better the common problems of rubber types needed and their conditions of use.

6. Foreign competition, not so much from a volume standpoint as from a pricing standpoint which could be even more troublesome.

7. Changing needs of the customer with one of the most significant being his apparent desire to have the producer carry out more of the basic compounding operation (oil, carbon black, oil-black, and other types of masterbatches).

8. The serious profit squeeze, which has resulted from prices stabilized at a rather low level and the increased selling costs incurred by all the items previously mentioned, and increased production costs resulting from new manufacturing facilities, stricter quality and color requirements, and greatly escalated raw material, service, and labor costs. This profit squeeze problem is a basic industry problem, not just one for the salesman, it was added.

In exchange for a fair selling price, the producing industry can, through research, offer consumers new diverse markets for their fabricated products and stable prices which will help level out the previously widely fluctuating natural rubber market. Raw material security and eventual reduction of the huge government-owned natural rubber stockpile are additional bonuses possible from a fair selling price.

Mr. O'Keefe concluded his talk with his analysis of what the producing industry must do to keep the industry strong, growing, and profitable. This included the development of new rubbers which could be substituted technically and economically for a larger share of the market now held by natural rubber or other natural or synthetic raw materials. This "technology" must be sold by a marketing team made up of technically trained businessmen as the field force, backed up by adequate market research, technical service, advertising and sales promotion, credit and accounting techniques adequate for dealing with individual customer problems in the first instance and improving cost consciousness in the second, and distribution that will keep the customer sold.

Improvements in general-purpose synthetic rubber should enable it to win back some markets lost in recent years to plastics and also to develop new markets both in combination with and in competition with plastics. New volume markets must be further developed in the transportation and materials handling fields as well as in the fields of rocket fuels and roadways.

Mr. O'Keefe expressed confidence that the synthetic rubber industry would meet the challenge of the future with enterprise and aggressiveness which will match or exceed that demonstrated during the inception of the synthetic rubber industry here in America.

Soviet Exhibit Opens

The Soviet Government officially opened its 42-day exhibition on June 30 in the Coliseum, New York, N. Y., to show Americans what Russians can produce in their factories and laboratories. The displays confirmed the sharp division in Russian economic life observed in the past by visitors to the USSR—high competence and ingenuity in the field of heavy equipment paralleled by mediocrity in consumer products.

The exposition was inaugurated by Frol R. Kozlov, First Deputy Chairman of the USSR Council of Ministers, at ceremonies attended by Vice President Richard M. Nixon. Also, President Eisenhower flew in from Washington, D. C., to make a quick tour of the exhibition.

The exhibition includes 12 major sections: (1) industry and agriculture; (2) science and technology; (3) radio and electronics; (4) peaceful uses of atomic energy; (5) optics; (6) transportation; (7) public education; (8) public health; (9) sports; (10) construction; (11) culture and art; and (12) public welfare.

From the heavy industry standpoint, the displays are impressive, showing, for example, dramatic uses of automation in the iron and steel field. But many of the consumer goods are obviously not up to U. S. style standards.

Of interest to the rubber and plastics manufacturers were a model of a manufacturing facility for producing butadiene from butane, a synthetic rubber truck tire, and various polytetrafluoroethylene plastics.

A booklet on synthetic rubber, available at the exhibition, describes the Soviet Union as the home of the first large-scale commercial synthetic rubber production in 1932, based on the work of Lebedev. This first commercial synthetic rubber in the Soviet Union was sodium butadiene or SKB rubber.

The basic type of all-purpose synthetic rubber produced in new Soviet plants and in some of the modernized plants is styrene-butadiene rubber. Other rubbers now being synthesized in the Soviet include SKS-30 styrene-butadiene, SKS-30A styrene-butadiene, SKMS-30A butadiene-methylstyrene, SKS-30AM butadiene-styrene, SKI synthetic isoprene rubber, SKN butadiene-nitrile rubber, SKS-10 butadiene-styrene rubber, SKMS-10 butadiene-methylstyrene rubber, butyl

rubber, SKT silicone rubber, fluororubbers, acrylic rubber, butadiene methylvinylpiridine rubber, polyisobutylenes, and "thiockols."

SORG Summer Outing

The Southern Ohio Rubber Group held its eleventh annual outing on June 5-6. The blind bogie golf tournament was held June 5 at Madden Golf Club, Dayton, O. The winners of the tournament were Lou Keyes, Dayton Rubber Co.; Dale Creech, Inland Mfg. Division of General Motors Corp.; Bill Herberg, Dow chemical Co.; John Barry, Witco Chemical Co.; and Lynn Blocher, Inland Mfg.

On June 6, 140 members attended the outing at Inland Mfg. Recreation Center, near Dayton. A full schedule of games was held, highlighted by the annual ballgame between the "Users" and the "Purveyors." The "Users" won by a score of 7 to 2 and were managed by Bob Puckett, Inland Mfg. Roy Marston, Columbian Carbon Co., led the "Purveyors."

The games and winners follow: shuffleboard—Joe Holmes, Schenectady Varnish Co., Jim Saettel, Inland Mfg.; kick golf—Skip Morris, Copolymer Rubber & Chemical Corp.; golf chip—Jerry Furry, Inland Mfg., Bob Radow, Dayton Rubber Co.; and horse shoes—Pick McBride, Dayton Rubber.

Following the games and a continuous smorgasbord, door prizes were awarded to all members; then came a bingo game.

The general chairman, Jack Feldman, Inland Mfg. was ably assisted by his committee to make this one of the most successful outings.

RIRC Holds Silver Anniversary Outing

Left to right: H. Web Day, 1959 Club chairman and evening program committee chairman; Lt. Commander Charles S. Carlisle, banquet speaker

Under a week-end of overcast and showery skies the Rhode Island Rubber Club celebrated its twenty-fifth anniversary at the Hotel Belmont, West Harwich by-the-Sea (Cape Cod), Mass. One hundred and sixty members and wives participated in a program beginning Friday afternoon, June 12, and extending to Sunday dinner, June 14. During this time there was entertainment varying from a golf tournament to psychological magic, from dancing to a six-piece orchestra to a ladies' coffee hour, from a putting contest to a glorious banquet honoring the past presidents of the Club. Two hundred and twenty-four attended the banquet, which was also honored by a talk by Lt. Commander Charles S. Carlisle, former commanding officer of the U. S. S. *Seawolf*, a nuclear powered submarine.

Golf was played at Bass River Golf Club, with the following winning prizes: low gross, Richard Steinmetz, United Carbon Co.; low net, J. H. Milner, Ansonia Wire & Cable Co.; second low net, William Maguire, United Carbon Co.; blind bogie, W. K. Priestley, Kaiser Aluminum & Chemical Corp.; second blind bogie, Ralph Robitaille, Phillips Chemical Co.; third blind bogie, B. Bradley, Griswold Rubber Co., Inc.; nearest to pin, Ray Szulik, Acushnet Process Co.; second nearest pin, W. J. Curtin, Naugatuck Chemical Division; third nearest pin, Superior Motor Co.; putting, H. Web Day, E. I. du Pont de Nemours & Co., Inc.; and longest drive, Connie Lyons, Rubber Corp. of America.

Women golf winners were: low net, Mrs. P. Bradley (Griswold Rubber); low gross, Mrs. Al Stohlman (Enjay Co.); blind bogie, Mrs. Jack Arnold (Enjay); putting, Mrs. Marjorie Haworth (Enjay); second putting, Mrs. Ezra Hanna (Davol Rubber Co.); and third putting, Mrs. Betty Cook (B. F. Goodrich Chemical Co.).

The showers subsided long enough to see some energetic persons get in some tennis. Prizes went to: first, Bert Stohlman, Enjay; second, Mrs. John Hussey, The Goodyear Tire & Rubber Co.; third, Steve Tyng, United States Rubber Co. Mixed doubles went to Mr. and Mrs. Bert Stohlman; consolation, Mr. and Mrs. John Hussey.

Bridge prizes were won by: first, Mrs. Roger Stellar (Goodrich Chemical); and second, Mrs. John Tronson (R. T. Vanderbilt Co.).

Past chairmen of the club who were present at the banquet and were given a gift of jewelry following their introduction were: Ezra Hanna, Davol (1938); Fred Bartlett, Kaiser Aluminum (1950); Leigh Kingsford, Kaiser Aluminum (1952); Roy Volkman, U. S. Rubber (1953); Urbain Malo, Narragansett Wire Co. (1955); Ray Szulik, Acushnet Process Co. (1956); Gil Enser (1957); and W. Ker Priestley, Kaiser Aluminum (1958).

In his banquet address, Lt. Commander Carlisle spoke on "Conquest of Inner Space," describing the life led by personnel aboard submarines which, today, with the advent of nuclear power and inertial navigation, are true submersibles. He commanded the *Seawolf* on the record 60-day submersion covering 15,000 miles. He stated that the United States is leading in this vital field, and he is confident that our Navy will keep us in this position.

In commemoration of the anniversary outing, the Rhode Island Rubber Club published a special historical booklet describing the progress of the Club. The 56-page brochure contains a history, officers and directors, outing committees, past chairmen, outing program, and membership roster.

Left to right: Ray W. Szulik, Acushnet, chairman of daytime activities; Edwin C. Uhlig, U. S. Rubber, solicitation chairman; W. K. Priestley, Kaiser Aluminum, general chairman; Roy Volkman, U. S. Rubber, publicity

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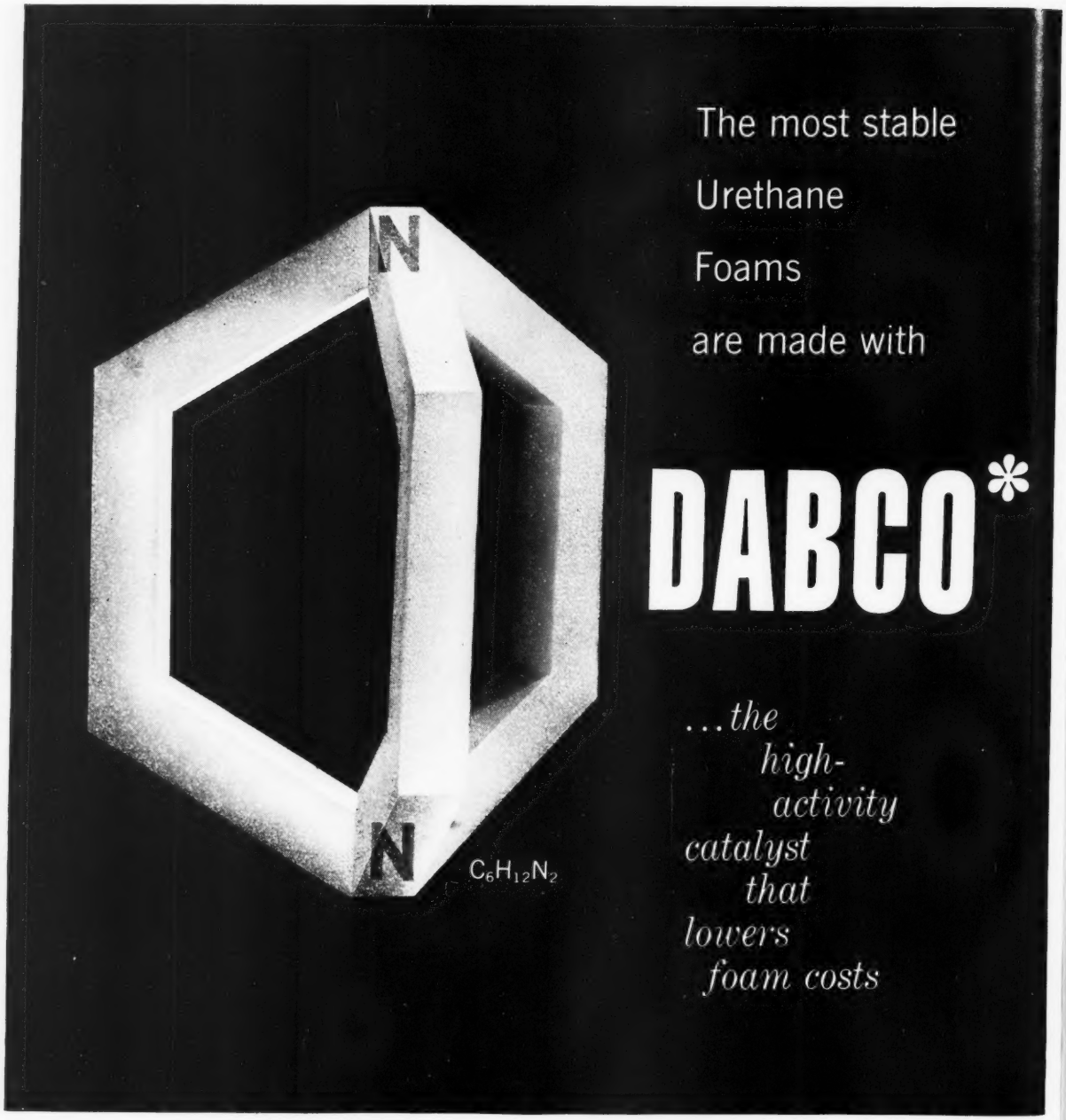

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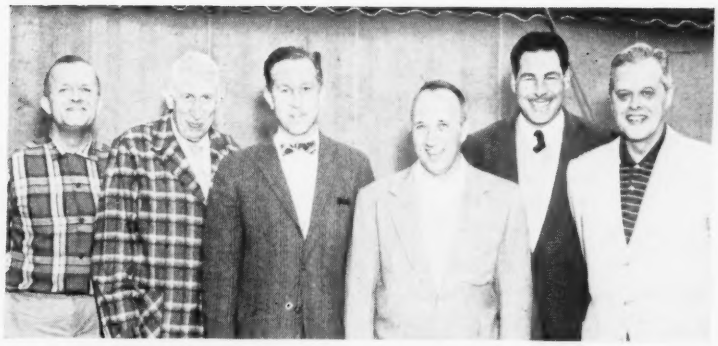


Boston RG officers attending the annual outing: *(left to right)* George Hunt, executive committee; Harry Atwater, historian; George Herbert, secretary-treasurer; William King, chairman; James Breen, past-chairman; and John Hussey, executive committee

Record Boston Outing

The twenty-third annual outing of the Boston Rubber Group was held at the Andover Country Club, Andover, Mass., June 19, in the midst of the longest rainy spell in the annals of the local weather bureau. The inclement weather, however, failed to daunt the 713 members and guests who attended to set an all-time record, or the 131 who braved the rain to compete in the nine- and the 18-hole tournaments scheduled for the day.

The committee was chairmanned by John M. Hussey, Goodyear Tire & Rubber Co., and included Harry A. Atwater, Malrex Chemical Co., and George E. Hunt, Simplex Wire & Cable Co. Everyone present received a door prize, courtesy of 211 firms and friends who contributed them.

The golf competition was organized by Lyle Longworth, Monsanto Chemical Co., and W. Platt, Columbia-Southern Chemical Corp., and showed the following winners: 18-hole tourney: low gross, J. S. Beale, Schenectady Varnish Co., (Soctex Trophy); A. E. Nelson, Goodrich Footwear & Flooring Co.; C. K. Mullin, C. K. Mullin, Inc.; J. Blonstrom, General Latex & Chemical Co.; low net, E. McCool, Vulplex, Inc.; J. F. Stiff, Columbian Carbon Co.; F. Young, Howe & French, Inc.; and C. S. Innis, Boston Woven Hose & Rubber Co. Top three honors in the kickers' handicap went to J. A. Loring, Roger Reed Co.; R. Stimets, United Carbon Co.; and C. Parisi, Colab Resin Corp. Nearest to pin was taken by S. Tyng, United States Rubber Co. High gross was claimed by P. Disantis; high net, C. J Tremblay, both guests.

The nine-hole tourney fared as follows: low gross, J. Christopher, Borden Co.; D. Larson, Haartz-Mason, Inc.; low net, P. E. Hurley, U. S. Rubber; J. J. Breen, Barrett & Breen Co. Kickers' handicap winners were G. Snow, Union Paste Co.; D. E. Welch, U. S. Rubber; and C. Kees, Sherwin-Williams Co. High gross went to H. Jamison, Celanese Corp., and high net, A. L. Polese, Borden Co.

The darts game, organized by N. Herthel and A. Panzeri, both Goodrich Footwear, awarded prizes to William McCabe and William Killam, both Avon Sole Co.

The tub and ball game, organized by H. Anthony, Tyer Rubber Co., and M. Duca, awarded prizes to the following (all tied): M. Perdijao, Godfrey L. Cabot, Inc.; H. Fishman E. I. du Pont de Nemours & Co., Inc.; J. Nolan, Firestone Tire & Rubber Co.; T. F. White, Boston Woven Hose; C. Parisi; and F. Muse, Goodall-Sanford Corp.

Horseshoes were played indoors, organized by Joseph Cullen, Marbon Chemical, and P. Blanchard, Blanchard Chemical Co. First prize went to P. L. Blanchard, P. L. Blanchard Co., and D. MacIntosh, Armstrong Cork Co.

The softball games, E. F. Freeman, Stedfast Rubber Co., director, and the putting contest, J. H. Fitzgerald, Harwick Standard Chemical Co., director, were called because of rain. Horse racing ran into the evening, directed by Carl Meyer, Harwick Standard, and C. K. Mullin.

The entire group sat down together in a big tent to a lobster dinner. The festivities and congeniality continued until 11:00 p.m.

The next meeting of the Boston Rubber Group will be on October 16 at the Somerset Hotel, Boston, with a special program in afternoon and evening, to be announced.

ACS September Meeting

The American Chemical Society will hold its 136th national meeting in Atlantic City, N. J., September 13-18. The Polymer Chemistry Division will feature symposia on such topics as "Recent Advances in Characterization of Polymers," "Chemical Reactions of Polymers," and "Problems in Polymer Chemistry."

The Paint, Plastics, and Printing Ink Chemistry Division will hold a symposium on "Plastics as Rocket Propellants."

Another paper will give a description of a Soviet institute of technology. Other topics include high-temperature laminates, new coatings and varnishes, radiation-resistant rubber. A symposium on "Pitfalls in Commercial Development" is planned.

The growth of the chemical process industries in Minnesota, and Japan's chemical industry will be described also.

The outing committee for the Boston RG outing consisted of: *(left to right)* Ed Freeman, softball; Nick Herthel, darts; Henry Anthony, tub and ball; Joe Cullen, horseshoes; John Hussey, outing chairman; Lyle Longworth, golf; Bill Platt, golf; and Carl Meyer, horse race

WASHINGTON REPORT

By JOHN F. KING

Stockpile Rotation Impasse Headed Toward Compromise

The government's rubber stockpile rotation program was suspended through most of July while legal experts from the House and Senate appropriations committees sought a compromise that would get the program back on the tracks. Pending a solution to the legal maze which the committees had created for themselves, no one in Washington could be quite sure of the status of the rotation operation — would it continue, or wouldn't it?

Despite the confusion, there was a general feeling that the House, which in May voted to kill rotation outright, would go along with the Senate's less drastic proposal to keep the program operating, but only on a limited basis. Final terms of the compromise are to be worked out by conferees from the two committees. At RUBBER WORLD'S deadline, the Senate-House conference had not started meeting.

Compromise Problems

When the conferees do get together, here is what must be settled: In approving the fiscal 1960 Independent Offices Appropriations last May, the *House provided only $33 million* to the General Services Administration for maintenance of the strategic stockpile, which contains an estimated 1.2 million long tons of natural rubber. The House refused to reappropriate another $107 million of unobligated GSA balances left over from fiscal 1959 to continue the stockpile rotation program for rubber, some fibers, and various industrial oils. The net effect of this action would have been to force GSA to sell off an estimated 30,000 to 40,000 long tons of deteriorating rubber than normally would have been rotated. This liquidation would have been required, even though the 1946 Stockpile Act forbids sale of stocked items without Congressional authority.

Before the smoke had cleared, GSA's Franklin Floete was knocking on the door of the Senate Appropriations Committee, urging that the Senate's version of the bill give the administrative agencies a little leeway to avoid a rubber "dumping" program.

In mid-June the Senate Committee responded with the requested provisions in its version of the Independent Offices Appropriations Act. Since passed by the full Senate, this version has confused everybody, but it seems to satisfy GSA that the executive branch has the elbow room it needs to maneuver through the legal conflicts besetting the stockpile program.

Instead of refusing to reappropriate the full $107 million in obligated GSA balances, as did the House, the Senate authorized GSA to spend $57 million in the year that began July 1 on stockpile maintenance. It took this action on the advice of GSA's Floete, who said that the $57 million reappropriation will "permit the continued rotation of a material to maintain quality when the amount of the inventory does not exceed the objective or when disposal of excess materials, without replacement, would disrupt market conditions."

GSA Position

In GSA's opinion, agency officials privately explain, Mr. Floete's arrangement with the Senate will permit the disposal of perishable goods in excess of stockpile goals, but will also permit the continued rotation of such items when their total inventory is below stockpile objectives.

In the case of rubber, the executive branch has never made any secret of the fact that GSA has too much of it in the strategic stockpile. The estimated 1.2 million long tons of natural rubber is more than enough to feed industry for an all-out mobilization period of five years. Changed strategic concepts of the past year or two hold that war in the nuclear era — even non-nuclear war — cannot last more than three years. By simple arithmetic, therefore, it is roughly estimated that the stockpile is overstocked with rubber by at least two-fifths the total amount that is now on hand.

Lest it be thought that GSA, or the executive branch for that matter, believes it should dispose of some hundred thousand-odd tons of stocked rubber, attention is called to Mr. Floete's pledge to the Senate Committee that "No such disposal action will, however, be undertaken by GSA until other interested Government agencies have had the opportunity to consider the proposed action and to consult as to its effects on the world market for that material. . . ."

As added assurance, Floete said, "All such disposal actions will be carried out with due regard to the protection of producers, processors and consumers against avoidable disruption of their usual markets."

In publishing his comments, the Senate Appropriations Committee added its judgment that "such considerations should cover world and domestic markets for such materials."

While the whole arrangement leaves something to be desired in terms of a clear-cut statement of where the rotation program stands, government and industry sources seem satisfied that the Senate compromise, if the House accepts it, is a fair settlement. It would prevent a market-wrecking disposal program and at the same time insure that stockpiled rubber is not left to rot in government storehouses. More important, it would permit a long-overdue, if modest step, toward a rational, gradual liquidation of the $8 billion worth of goods which this country hoarded against the demands of a World War II-type of conflict, the type that probably never will again be fought.

USA-USSR Rubber Trade Banned By State Dept.

That crack in the Iron Curtain which seemed to promise new orders for American rubber products, machinery, and synthetic rubber technology appears to have been closed again by the U. S. State Department. The Russians for the past year or more have appealed for a boost in US-USSR trade, arguing that the U. S. petro-chemical industry, paricularly synthetic rubber producers, would find

handsome returns from doing business with the Soviet Union.[1]

Although the Russians have been saying they need machinery and technology or "know-how" to equip a number of consumer industries, they have consistently emphasized their need of Western help in developing their synthetic rubber industry.

U. S. Position Reaffirmed

At the request of Sen. J. William Fulbright (Dem., Ark.), chairman of the Senate Foreign Relations Committee, the State Department early in July provided detailed answers to 22 questions posed by Fulbright about the real prospects of a boost in US-USSR trade. In general, the Department hewed to the line spelled out last year by Undersecretary Douglas Dillon that despite Russian claims, there can never be more than minimal commerce between East and West.

As long as the Soviets look upon their foreign trade only as a means of achieving "autarchy" or complete economic self-sufficiency as quickly as possible, Soviet trade policy shall always be politically, not commercially oriented, the Department said. The Western businessman has little, therefore, to hope from Communist trade nibbles. The Department held to this assertion despite the fact the United Kingdom just this spring completed a Russian trade agreement calling for the exchange of hundreds of millions of dollars worth of goods over the next five years.

SR "Know-How" Restricted

One question asked by Fulbright evoked an answer that should be of particular interest to some readers of RUBBER WORLD. The Senator, noting that Premier Khrushchev a year ago offered to buy U. S. equipment and know-how for the manufacture of synthetics, especially synthetic rubber, asked the State Department "what kinds of such equipment and information would be considered non-strategic" and thus eligible for export to Russia? The question was framed against the background of recent U. S. Government moves to bar the export to Russia of certain types of oil and rubber production technology.

The answer was as follows:

"This category is apparently directed at petrochemical plants and processes and plastic plants and processes. Such plants and processes are not under international control nor included in any Battle Act (prohibition) listing. Virtually all items relating to such plants and processes are under unilateral U. S. export control, however, with a presumption of (license) denial to the Soviet bloc.

"It is believed," the Department continued, "that the U. S. has a sufficient technological lead over the rest of the world that its unilateral control can be effective in denying both the plant and the technological know-how to the bloc. The applicable technological know-how is under a presumption of denial to the bloc."

[1] RUBBER WORLD, Dec., 1958, p. 423.

HR-5 Foreign Investment Tax Bill Finally Gets Support from Goodyear

The rubber industry — at least one of its leading companies — has awakened to the fact that this industry may be among the chief beneficiaries of the only piece of tax relief legislation that has any chance of passage in the current session of Congress.

HR-5 Campaign

Rep. Hale Boggs' "Foreign Investment Incentive Tax Bill," popularly known as HR-5, may not pass both the House and the Senate this year. But it seems a sure bet to make it through the House before adjournment and thus become one of the first orders of Senate business in the second half of the 86th Congress next year.

Boggs, a Louisiana Democrat and an influential member of the tax-writing House Ways & Means Committee, has lined up the support of the nation's most important companies and business organizations for his plan to lighten the tax load on the international operations of American business. He has built his support through a carefully planned campaign of subcommittee hearings, meetings with business leaders, and endorsements from government leaders such as Vice President Nixon.

A tribute to his hard work for the legislation has been grudging, if not total support, from the Treasury Department, the executive agency which has fought hardest for the Administration's current hold-the-line policies on taxes and spending.

Goodyear Gives Support

But absent from the ranks of support, until recently, has been the rubber industry.[2] This absence has been the subject of some wonderment on the part of advocates of the Boggs bill. They look at the financial reports of both major and minor firms in the industry and conclude that the rubber companies have as much and possibly more to gain from enactment of all or part of HR-5 than any other segment of American business.

Goodyear Tire & Rubber Co., whose international investments are second to none in the industry, finally on July 15 took a position on the Boggs bill. In a letter to Rep. Wilbur D. Mills (Dem., Ark.), chairman of the Ways & Means Committee which had just concluded three days of public hearings on the measure, Goodyear went on record as strongly endorsing HR-5.

Basically, the measure would authorize a new class of "foreign business corporations," or "FBC's," to defer payment of U. S. corporate income taxes on foreign earnings until they are repatriated for distribution in this country. Boggs has put other tax-relief measures into his bill, such as the extension of the 38% corporate tax, now the privilege of only Western Hemisphere Trading Corporations, to all foreign income of U. S. firms; the right to compute foreign earnings from various countries on an overall, instead of a per-country basis, for U. S. tax credit purposes; the right to exempt income from "involuntary conversion" of assets as a capital gain; the right to claim a U. S. tax credit for taxes "spared" by a foreign country; and the right to deduct foreign losses as ordinary income losses, not capital losses. But the FBC and tax deferral provisions are the keystones of his bill, Boggs says and indicates he will accept half-a-loaf legislation.

In its statement to Chairman Mills, who has not been an enthusiastic supporter of the Boggs bill, Goodyear pointed out that "American taxpayers are investing billions of dollars in foreign economic assistance through our own mutual security programs as well as contributions by the U. S. to international agencies. Insofar as private foreign investment can assist the less developed areas of the world to expand and develop their economies, it will thereby relieve the burden of economic assistance. While some loss of revenue may be entailed through the passage of HR-5, it should be more than offset by a reduction of U. S. expenditures for foreign assistance."

The Treasury estimates that between $100 and $500 million can be lost to U. S. tax collectors by enactment of the Boggs bill, depending upon its final form.

The Goodyear statement referred to the competitive difficulties of doing business in countries which extend preferential tax treatment to its own national concerns. It said U. S. firms abroad are penalized by U. S. tax policies in various respects, while trying to compete with local business. Enactment of the Boggs bill, Goodyear maintained, would help equalize the advantages, official and unofficial, which their foreign competitors now enjoy.

[2] *Ibid.*, Jan., 1959, p. 561.

Goodyear's endorsement came after the full Committee had heard more than 50 witnesses give their blessing to the bill. The three days of hearings did not produce a single opponent of the legislation. The same performance record was scored back in December when Boggs' own Foreign Economic Policy Subcommittee held extensive hearings on the measure. The Committee is expected to go into executive session to vote on the bill late in July, and supporters of the measure expect House passage not long after.

Rubber Wage Talks Will Eye Steel Strike Progress; Some Settlements in Canada

The United Rubber, Cork, Linoleum & Plastic Workers of America (AFL-CIO) union meets with representatives of the Goodyear Tire & Rubber Co. and United States Rubber Co. in mid-August to start a new round of rubber industry labor negotiations, but in advance of the meeting both company and union officials were keeping their eye on the progress of the steel strike, which began on July 15. In Canada, the strike of Oil, Chemical & Atomic Workers union against Polymer Corp., Ltd., which began in mid-March, was settled in late June. B. F. Goodrich of Canada, Ltd., signed a new contract with the URCLPWA in June also.

U. S. Wage Talk Problems

The URCLPWA in early July sent contract "reopener" notices to both Goodyear and U. S. Rubber, advising the companies they were the first two in the industry that would have to settle with the union on a "general wage increase."

In these wage negotiations both the union and the companies have overriding reasons why their respective points of view should prevail. The URCLPWA maintains that profits in the industry have been setting new records, particularly in the case of Goodyear, and that productivity increases have grown "substantially" in recent years.

The companies, on the other hand have powerful counterarguments: Three of the Big Four have just come through long fringe-benefit strikes; U. S. Rubber, 22 days; B. F. Goodrich, 54 days; and Firestone, 60 days. Moreover, a substantial new wage increase, coupled with higher natural rubber prices, would force a price increase for rubber products. Rubber companies, along with big firms in other important industries, are on the spot politically since the Eisenhower Administration has succeeded in making inflation in the public mind synonomous with evil, and anything that contributes to inflation is consequently bad.

Then there is the relation of the steel strike to rubber industry wage negotiations. The United Steel Workers union under President David MacDonald, rebuffing the steel companies' various proposals for a wage-hike moratorium to lick inflation, walked out after a two-week postponement of the strike urged by President Eisenhower. How long the steelworkers will be out, and what will bring them back in the way of management offers cannot be estimated, but the settlement that eventually has to be made in steel will have a heavy impact on the rubber industry settlement. It could determine whether some of the major rubber companies must be shut down again this year.

URWCLPWA will be under heavy pressure from its 170,000 members to "bring home the bacon" if MacDonald's steelworkers can hold out for a substantial settlement. And hold out they will have to, because steel producers capitalized on strike fears to fill orders at a tremendous rate in the months immediately preceding the walkout so that consuming industries are said to have inventories sufficient to carry them through a 60-90-day strike.

The rubber companies themselves will be in a peculiar situation in the face of a strike threat. Goodyear was not struck in the URWCLPWA walkouts earlier this year over fringe benefits. U. S. Rubber, the second target for wage negotiations, was closed down for the shortest period of the three companies which were struck. Both Firestone and Goodrich suffered long strikes over the fringe-benefit issues. The attitudes of these several companies will therefore differ in their bargaining with the URWCLPWA on wage increases.

It is expected that management and labor in the rubber industry will go on negotiating until there is a steel settlement, and that the talks will be conducted with both sides looking over their shoulders at the stop-and-start steel negotiations in New York.

Canadian Settlements

Settlement was reached on June 23 between Polymer Corp., Ltd., and the local OCAW union in the 97-day strike at the company's synthetic rubber plant at Sarnia, Ont. The one-year settlement provided an across-the-board increase of 9¢ per hour. The union had asked for about 22.5¢ per hour. Three weeks' vacation for union employes after 10 years of service will commence in 1960. Shift differentials the same as those offered by the company on March 17, the day before the walkout, were finally accepted by the union.

The new contract provides the same degree of union security as existed in the expired contract although the union sought a union shop. No change was made in the no strike-no lockout clause. The issues of contracting out work and trades recognition were settled so that employes received assurance against layoffs in connection with contracting out work and trades recognition.

A new one-year contract between B. F. Goodrich of Canada, Ltd., and the local URWCLPWA union was signed on June 15, which granted the employes wage increases ranging from 7½¢ to 17½¢ per hour.

Four Trade Law Cases Recorded in July

Rubber and associated industries seem to be getting their share of attention from the Federal Government in connection with anti-trust and other fair-business practice laws. In the recent past one or another rubber company, an affiliated firm in another industry, or the manufacturers trade association ran afoul of some federal trade law almost every month.

In July there was trouble on four fronts. Two involved anti-trust laws—one settlement restricting the tire, battery, and accessory marketing activities of the big oil companies, and a new grand-jury investigation of rubber company mattress manufacturing. The other two involved charges of misleading advertising by the Federal Trade Commission, again one new case and the settlement of an old one.

FTC Actions

FTC on June 26 ordered Firestone Tire & Rubber Co. to stop using "misleading" claims of "original equipment" in the promotion of its "Super Champion" tires. The case, which dates back to alleged Firestone advertising practices in early 1957, was an FTC endorsement of the findings of Hearing Examiner J. Earl Cox, issued on January 13 of this year.

FTC on July 10 settled another misleading advertising case by announcing that 21 major sellers of auto batteries, including some of the nation's largest oil, tire, and mail-order companies have agreed to abide by an FTC demand that such advertising be stopped.

Among the signers to the agreement, which stipulated that the firms would stop misrepresenting the quality of a battery without "clearly and conspicuously" displaying the exact guarantee, were Goodyear, Goodrich, Firestone,

Dunlop, U. S. Rubber, Gulf Tire & Supply, Delco Division of General Motors, Sears Roebuck, and Montgomery Ward.

Justice Department Actions

Earl Jenkinson, chief of the Justice Department's Midwest Anti-Trust Division, announced that grand juries have been convened in Denver, Colo., and Memphis, Tenn., to look into the mattress manufacturing practices of Firestone and U. S. Rubber. The Justice Department gave no further details of the grand juries' probes, which by law are secret. The two companies involved said they knew nothing of the investigations, but a U. S. Rubber spokesman was quoted as being surprised by "this new action by the Department of Justice." The unidentified U. S. Rubber spokesman said the investigations "seems to duplicate an investigation on the same subject which began in August, 1957, in Chicago."

In July also, Justice announced it won two separate decrees from federal courts. One bars Shell Oil Co., General Petroleum Corp., Tidewater Oil, and Union Oil from making any agreement with any tire, battery, and accessory dealer that prohibits the dealer from buying TBA equipment from other suppliers. This same decree, which affects only service stations in California, Oregon, Washington, Nevada, and Arizona, forbids any such marketing agreement between supplier and distributor.

The other decree, entered July 1, forbids Sun Oil Co., throughout the whole area of its operation, from requiring any of its independent dealers to purchase their tires and other items from Sun and its affiliates.

Both of these anti-trust cases were instituted by Justice in 1950.

INDUSTRY NEWS

Malaya's Research Head, Noted Planter Visit U. S.

Two important visitors from Malaya visited the United States during July and August, and luncheons in their honor were held at the Plaza Hotel, New York, N. Y., on July 6 and 20, respectively, by the Natural Rubber Bureau. The first was Leong Hoe Yeng, past chairman of the Rubber Producers' Council and currently a member of the Council, and of the Malayan Estate Owners' Association and the Malayan Fund Board. Mr. Leong is also a standing member of the Federal Legislature of Malaya.

The second visitor was Sir Geoffrey Fletcher Clay, who recently took office as Controller of Research & Development for the Malayan rubber producers. Sir Geoffrey is headquartered in Malaya and was appointed as a result of the report made in 1957 by a group of British experts headed by Prof. G. E. Blackman, of Oxford University, who were appointed by the Rubber Producers' Council in 1956 to inquire into the competitive position of natural rubber. Sir Geoffrey is an outstanding scientist and administrator with a long record of achievement in both fields, including service for the British Colonial Office, the United Nations, and the Food & Agriculture Organization.

Mr. Leong's Visit

At the July 6 luncheon Mr. Leong drew upon his wide experience in natural rubber production and Malayan politics to give the rubber importers and consumers of this country some encouraging words about the future of natural rubber. With regard to the political situation in Malaya, he said that the young government appeared to be very stable, and with special reference to rubber production he added that the replanting and new planting programs were progressing satisfactorily.

Mr. Leong came to the United States after a visit with rubber industry executives in England. In the United States he planned to talk to American rubber industry executives in Washington, Akron, Buffalo, Los Angeles, and San Francisco and in Canada in Toronto and Ottawa, before returning to Malaya.

Sir Geoffrey and Rubber Research

Sir Geoffrey had also come to the United States from England where he had been visiting rubber research institutes where work financed by the Malayan Rubber Fund (a cess of ¾¢ a pound on all rubber exported from Malaya) was being carried on. As Controller of Rubber Research, Sir Geoffrey has as his primary first responsibility the coordination of research and other activities being carried on by the Rubber Research Institute of Malaya, the British Rubber Producers Research Association, and the Natural Rubber Bureau. His visit to the United States is exploratory in nature, and he hopes to learn about the needs of the American consumer of natural rubber and the progress in synthetic rubber in this country, with special reference to synthetic polyisoprene and polybutadiene.

D'Arlene Studio

H. C. Bugbee, NRB, *(left)*, and Ross R. Ormsby, RMA *(center)*, discuss the rubber situation with Leong Hoe Yeng at the July 6 luncheon

At the July 20 luncheon and at a separate interview with RUBBER WORLD representatives, Sir Geoffrey explained that he was establishing a central coordinating advisory committee consisting of Sir Henry Melville, of Birmingham University and an eminent polymer chemist; Prof. Frank Engeldow, of Cambridge University and an outstanding agricultural scientist; E. A. Murphy, one of Dunlop Rubber Co.'s leading rubber technologists; Sir Eric Rideal, one of England's outstanding industrial chemists; and two representatives of the Rubber Growers Association. Subcommittees or visiting committees from this central coordinating committee will be asked to visit three or four times a year the BRPRA in England, the RRIM in Malaya, and the Natural Rubber Bureau in the United States to evaluate the progress of the research and other activities being carried out. In the United States and in

W. E. Cake, United States Rubber Co. vice president; Sir Geoffrey; Ross R. Ormsby, RMA; and H. C. Bugbee, NRB, *(left to right)* at the July 20 luncheon at the Plaza Hotel in New York

Europe, consideration is being given to the establishment of technical service organizations similar to those used by American synthetic rubber producers in order to service more adequately natural rubber consumers.

In the Blackman report it was recommended that field experiments in Malaya be examined critically and only those of real scientific value be continued. Sir Geoffrey stated that the technique of statistically planning such experiments was now being instituted and in order to facilitate field operations substations of the RRIM are being established in order to carry out this part of the work more efficiently.

Since in Europe and America the largest-volume usage of natural rubber is with medium and lower grades rather than the highest-quality grades, and since most of this rubber is from smallholders rather than European estates, the emphasis will be directed at reorganization of smallholder collection procedures and economies in order to improve the uniformity of these grades. The work of the RRIM's advisory service to smallholders and larger estate owners also is to be intensified.

In connection with improving and broadening the properties of natural rubber, it was said that graft polymerization with fresh latex in Malaya has been found to have decided advantages and that this opens up many possibilities for modified types of natural rubber. It is also considered within the realm of possibility that if and when carbon black producing companies and plants were established in Sumatra, natural rubber-carbon black masterbatches might become available.

Sir Geoffrey said that he felt there would be a continuing and growing market for increasing volumes of both natural and synthetic rubbers because of the growing per capita consumption throughout the world.

New Schulman Plant

Alex Schulman, president of A. Schulman, Inc., Akron, O., recently announced plans for a new reprocessing plant for plastics at Orange, Tex. The company is one of the nation's leading producers of reprocessed polyethylene, polystyrene, vinyl, and other plastics.

Paul Wysynski, assistant plant superintendent of Schulman's main offices at Akron, has been appointed manager of the new Texas unit.

The plant, the company's fourth in the United States, will be situated on Chemical Row adjacent to many petrochemical plants specializing in the production of various resins. The company reprocesses resins of all types for manufacturers of toys, kitchenware and household items, and industrial items to specification. Much of its production is exported to the company's overseas warehouses for factories throughout the world.

Operations at the Orange plant are expected to begin in the early fall. Fifty employes will be hired for a three-shift around-the-clock production schedule.

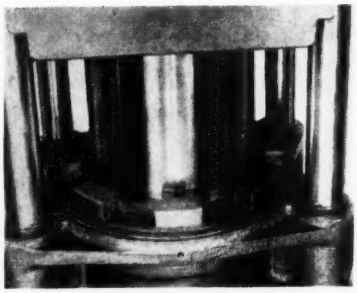
The initial capital investment will provide for a prefabricated metal building and machinery which will be primarily blenders and extruders. Sufficient space will be provided for future expansion.

Breech Block Packing

Stewart Bolling & Co., Inc., Cleveland, O., has introduced a new method for packing the hydraulic cylinders of presses which mold rubber and plastics. The new application, covered by United States patent No. 2,820,546, employs a breech block principle.

The new method places lugs in the circumference top of the hydraulic cylinder. The gland ring is flanged alternately to drop between the flanges on the top of the cylinder. If the packer is properly seated, the pressure of the gland ring is even without any adjustment. Previously, the usual method of packing hydraulic cylinders had been to bolt down the gland ring in several places into the cylinder circumference.

Bolling's new method requires little time to change packers. No studs or bolts are used so that dangers from uneven ring tightening, stud breakage, and ram scoring are eliminated. Press packer life is prolonged because of the even pressure on the packer when installation is made, reports the company. Also, time is saved in press operation and maintenance by requiring less frequent packer change.



Breech block packing of hydraulic cylinder on Stewart Bolling press

Tire Prices Cut

The Goodyear Tire & Rubber Co., Akron, O., is reducing replacement tire prices from 5 to 15% on certain of its passenger tire lines. The decrease will apply to such lines as the Custom Nylon, Custom Rayon, Safety All-Weather Nylon, and also prices of the now-popular 14-inch replacement tires on the same basis as the 15-inch tires. The move helps in the fight of inflation and provides motorists with greater tire values.

NTDRA Honors Ike

President Dwight D. Eisenhower will receive the first Faith in American Business Award from the National Tire Dealers & Retreaders Association on September 14 at the opening session of its thirty-ninth annual convention at the Sheraton Park Hotel, Washington, D. C. In honoring the President, the Association's executive secretary, W. W. Marsh, said, "The Association hopes to focus the attention of the business community on the need for preserving our economic freedom through fiscal integrity."

Mobay to Make Polycarbonate Resins

Construction of new facilities to manufacture polycarbonate plastic resins has begun by Mobay Chemical Corp. at its present plant location in New Martinsville, W. Va. Expected to go on stream early in 1960, the new plant will be the first in America to produce polycarbonate resins in commercial quantities.

Much of the technology of the process was originally developed in Germany by the Farbenfabriken-Bayer company, which owns Mobay jointly with Monsanto Chemical Co. Heretofore, polycarbonate resins have been available here only in pilot-plant quantities.

Mobay's decision to enter this field was based on a high level of interest in the material's engineering properties, particularly among manufacturers of components for the automotive, electronics, computer, and office equipment industries.

The polycarbonate resin, which Mobay will market under the trade name "Merlon," can be fabricated into end-use products by most conventional thermoplastic processing methods, including injection molding, extrusion and vacuum forming. The resulting product is said to have high impact resistance, excellent dimensional stability, and greater resistance to heat, moisture, and weathering than most thermoplastic materials now known.

The details of proposed plant capacity and initial production volume planned for polycarbonates are not yet completed, reports J. R. Eck, Mobay president. The resin, however, will be of the same high commercial quality as the German-produced material which has found much interest here.

New Collapsible Dam

The Firestone Tire & Rubber Co., Akron, O., has manufactured and installed in the Los Angeles River a rubber dam designed to be collapsed at the first indication of flood danger. This unique dam—a giant nylon bag coated with neoprene—was developed to serve dual requirements of the Los Angeles Department of Water & Power in providing the city with water and of the U. S. Army Engineers in protecting the city against floods.

Previously the job had been handled by a removable wooden dam, which, when removed during winter months, resulted in loss of valuable water.

The Firestone dam can be left in place the year around. It can be collasped in 10 minutes should flood danger arise. When the flood recedes, the giant bag, which is 150 feet long and eight feet in diameter, can be inflated again by pumping water into it. The inflation requires about 25 minutes and 50,000 gallons of waters to inflate it to its maximum height.

The dam was constructed in 30-foot sections which later were cemented together with Loxite adhesive to form one piece. Constructed of two plies of nylon coated with neoprene, the dam is bolted to the cement bottom and retaining walls of the river.

It is expected that other installations will be made in the same area. The Department of Water & Power estimates that some 3,000 acre-feet of water valued at $75,000 can be conserved annually.

Dow Corning Shows Seven New Silastics

The availability of five new Silastic silicone rubber compounds and two new Silastic silicone rubber bases was announced recently by Dow Corning Corp., Midland, Mich., at a press-luncheon at the Barbizon-Plaza Hotel, New York, N. Y. These new materials are said to offer the end-user better quality parts, few design limitations, improved properties, and improved processability.

Two of the new materials are general-purpose compounds, Silastic 52 and Silastic 82. They are 50 and 80 (respectively) durometer (Shore A hardness) silicone rubber stocks that can be blended to obtain any intermediate hardness. Ease of processing is an outstanding feature of both rubbers. Maximum heat stability is evidenced by retention of flexibility after several days' exposure at 600° F. These two rubbers are designed for many types of applications, including gaskets, seals, diaphragms, and tubing for the aircraft, automotive, and appliance industries. Both Silastic 52 and 82 are also supplied in uncatalyzed form as Silastic 52U and Silastic 82U.

Two new silicone rubber compounds for wire and cable insulation were announced. Silastic 1601, designed to meet the requirements of insulation for Underwriters Laboratories standards for 200° C. rated fixture and appliance wire, is said to give faster extrusion rates and dense, homogeneous insulating walls without postcure. Silastic 1602 is designed for cable constructions that demand a combination of good physical and electrical properties and excellent heat resistance. It is recommended for cable constructions outlined in MIL-W-8777 Aircraft Cable, MIL-19381, Nuclear Shipboard Cable, and MIL-W-16878 Hook-Up Wire.

Silastic 433 Base, a silicone rubber masterbatch for formulating a wide variety of finished compounds, was one of two bases announced. It is a silicone polymer with a quantity of reinforcing silica added and is translucent in color, permitting easy pigmenting. Because the masterbatch readily accepts additional fillers, compounds up to 80 durometer Shore (A) can be formulated.

The other masterbatch is a new base composed of a fluorosilicone polymer with a quantity of reinforcing silica filler added. Designated Silastic LS-422 Base, it is said to be the first fuel- and solvent-resistant silicone rubber masterbatch. It permits the compounder to design fluorosilicone compounds with physical and solvent-resistant properties appropriate to a specific application. Low volume swell after immersion in jet fuels, solvents, and hydraulic oils makes compounds manufactured from LS-422 Base of prime interest to the missile and aircraft industry.

The seventh material announced was Silastic LS-62, a new easy-to-process fuel-, solvent-, and oil-resistant fluorosilicone rubber. Parts from this new rubber can be made by all conventional means of fabrication such as molding, extrusion, calendering, and dispersion coating. It is serviceable at both high and low temperatures and exhibits very low volume swell and little physical property change when immersed into jet fuels and hydraulic oils. White in color, the new rubber is pigmentable to any desired shade. Catalyzed with 2, 4 dichlorobenzoyl peroxide, the material is designated Silastic LS-63. It is also supplied as Silastic LS-63U without the catalyst.

More detailed information on these new materials is available from the company. Also, this information will be included in the "New Materials" section of forthcoming issues of RUBBER WORLD.

Aids Tire Builder

The B. F. Goodrich Co., Akron, O., has announced an electronically controlled tire building machine which gives the tire builder a tool to produce a better product with less effort. The machine has been in operation at B. F. Goodrich Tire Co.'s Los Angeles plant for two years.

The machine virtually eliminates the use of muscle power, improves tire quality by eliminating human error, and makes tires more uniform in construction. Directed by a complex electronic control, it performs 18 operations which formerly were done by the tire builder. It increases production by automatically performing the heavier and repetitive operations which fatigue the tire builder.

The key to the machine is an electronic control with nearly 200 vacuum tubes. The control reads a punched tape which instructs the machine what to do and when to do it.

By changing tapes and making a few mechanical adjustments the machine may be quickly adjusted to build different sizes and types of tires.

Lyon Memorial Trophy

A new perpetual racing trophy, the Walter E. Lyon Memorial Award, was presented for the first time to Johnny Thomson at the Annual Victory Dinner, May 31, following the forty-third running of the 500-mile Indianapolis Memorial Day Race.

The solid silver 20-inch trophy will honor the race driver who achieves the fastest four-lap, 10 miles, qualification speed each year. The winner's name, speed, and year will be engraved on the trophy which will be permanently displayed at the Speedway Museum.

Thomson, whose average speed of 145.908 mph paced the 1959 field, received a silver platter engraved with a likeness of the trophy for his permanent possession.

The trophy and silver platters to be awarded each year have been donated by Mrs. W. E. Lyon and daughters in memory of Mr. Lyon.

Mr. Lyon began his tire engineering career with The Firestone Tire & Rubber Co., Akron, O., in July, 1929. He was made director of tire engineering and development on August 1, 1953, a position he held until his death on October 4, 1958. His primary concern was the development of better and safer race tires.

Under his direction the Firestone racing division was expanded to provide tires for all types of racing, including sports car, stock car, sprint car, and midget events.

Trade Relations Theme at MCA's 87th Meeting

The Manufacturing Chemists' Association, Inc., held its 87th annual meeting at The Greenbrier, White Sulfur Springs, W. Va., June 11-13 with some 860 persons in attendance. At the meeting directors and officers were elected; Dr. Milton S. Eisenhower gave a special report on the Latin American economic-cultural situation: O. V. Tracy, Esso Standard Oil Co., spoke on, "Doing Business with the Russians"; and General John E. Hull, USA (Ret.), president of MCA, presented a report on the committee activities of the association.

New Officers and Directors

John T. Connor, president of Merck & Co., Inc., was elected chairman of the board of directors of MCA, succeeding Harry B. McClure, vice president of Union Carbide Corp. Dr. David H. Dawson, vice president, E. I. du Pont de Nemours & Co., Inc., succeeds Connor as chairman of the executive committee. General John E. Hull, full-time president and a director, was re-elected.

Elected as vice presidents were Thomas S. Nichols, chairman of the board of Olin Mathieson Chemical Corp., and R. W. Thomas, vice president of Phillips Petroleum Co., Bartlesville, Okla.

Directors elected for a three-year term are: Peter Allen, president, Canadian Industries Ltd., Montreal; L. G. Bliss, president, Foote Mineral Co.; Bruce K. Brown, president, Petroleum Chemicals, Inc.; Howard S. Bunn, president, Union Carbide Corp.; R. F. Coppedge, Jr., president, National Distillers & Chemical Corp.; A. E. Forster, president, Hercules Powder Co., Inc.; John R. Hoover, president, B. F. Goodrich Chemical Co.; Theodore Marvin, president, Michigan Chemical Corp.; Carl F. Prutton, executive vice president, Food Machinery & Chemical Corp.; and Robert B. Semple, president Wyandotte Chemicals Corp.

Latin American Relations

Dr. Milton Eisenhower, president of The Johns Hopkins University and an expert in international affairs, discussed the political, economic and cultural position of Latin America, a continent in transition, and the relationship of the United States to these Latin American countries. He was convinced that no other area of the world is more important to the United States than Latin America, and that by working together intelligently, the nations of this hemisphere can progress mightily, and jointly can maintain peace among the American republics. Thus, this hemisphere can set standards for all the world to emulate, he concluded.

Trade with Russia

O. V. Tracy, vice president of Esso Standard Oil Co. and chairman of the Trade Policy Advisory Committee of the MCA, condemned trade deals that strengthen Russia's industrial machine, emphasizing that Soviet offers of increased trade and peaceful competition are part of Russia's new strategy of conquest. Russia's new economic front in the cold war was established because America and NATO took a firm stand against Russian armed threats and because military adventures could easily develop into thermonuclear war.

Russia wants advanced manufacturing processes from the West, said Tracy, and advanced equipment to use as models for its own production lines. It does not want to import products its people need; it wants chemical, nuclear and electronic equipment.

The Russians used a similar trade gambit in the 1930's and gained years in economic development by tapping the advanced technology of the West. As soon as they got what they wanted, trade with the outside world was cut off practically overnight.

Tracy indicated that the Russians pay no more attention to Western patents on industrial equipment and manufacturing processes than they do to their pacts and promises, which they break as they please.

The key element in Russia's current seven-year plan is the Soviet chemical industry, which is supposed to increase by 300 per cent by 1965. Chemical-industry superiority is one of the outstanding technical advantages the United States has over the Soviet Union. The free world must refuse to help Russia enlarge its industrial potential, and we must do all in our power to maintain the lead in providing the peoples of the world with improved standards of living, he said.

Noting the Soviet Premier's threat to bury the West, Tracy said it won't be fulfilled unless the Free World "supplies the spade."

Forms New Patent Firm

The formation of the National Patent Development Corp. was announced recently by Jess Larson, former Federal Works Administrator and chief of the War Assets Administration following World War II. With offices at 68 William St., New York 5, N. Y., and at 1000 Connecticut Ave., Washington, D. C., the new firm will be equipped to aid corporate clients in the selling or licensing of patents and processes which have been developed by their research and development programs and which do not have a natural outlet within their own corporate structure.

Larson, who is chairman of the board of directors of the new firm, stated that clients will also receive data concerning patents and processes which would be applicable to their field of business activity. He is aware of the need of a service organization that would facilitate the interchange of information and know-how among corporations. He stressed that millions of dollars spent annually by industry for research and development are lost to the nation's scientific and industrial growth because the resultant patents and processes are often not effectively or profitably utilized.

In addition to Larson, other members of the board of directors of National Patent Development Corp. are: John L. Handy, president of Handy Associates, Inc.; Eugene M. Zuckert, former member of the Atomic Energy Commission; William Stix Wasserman, president of Investment Corp. of Philadelphia; Jerome I. Feldman, president of Derel Producing Associates, Inc.; Charles H. Truman, partner in the investment banking firm of Truman, Wasserman & Co.; Martin M. Pollak, attorney; Arnold B. Christen, attorney and former chairman of the Patent Office Affairs Committee of the Patent Lawyers Association of America; and Lord Malcolm Douglas Hamilton, O. B.E., D.F.C., former member of the British House of Commons.

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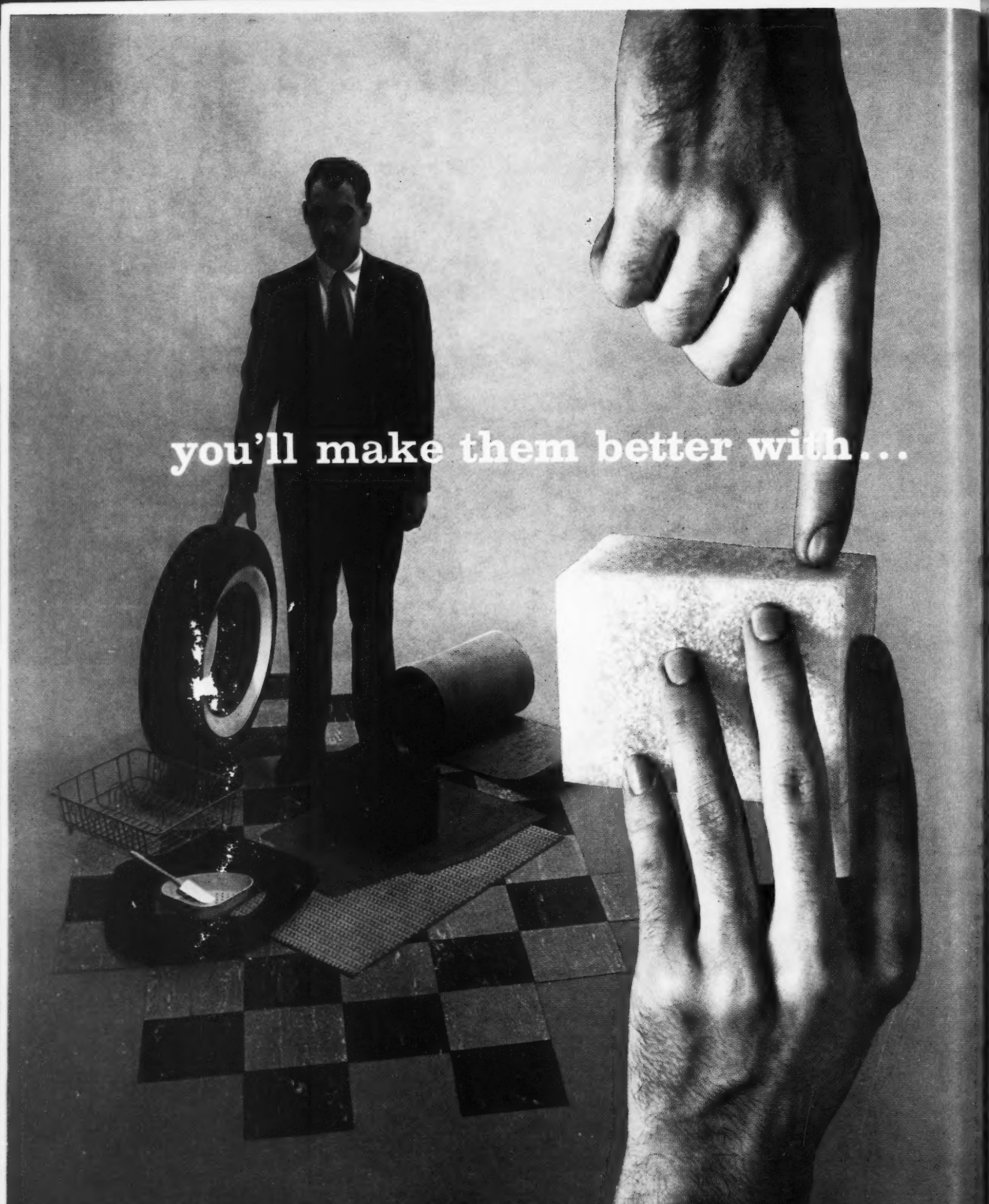

NEW POLYSAR S-630

An easy-processing "hot" rubber that won't stain – won't discolour!

POLYMER CORPORATION LIMITED
POLYSAR
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SYNTHETIC RUBBERS

Polysar S-50

Polysar S-630

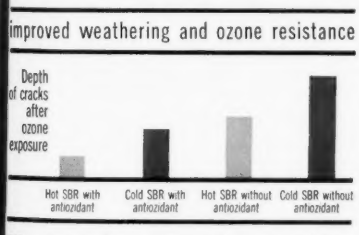
The laboratory test stocks reproduced above and at the right illustrate the relative staining and discolouration under sun lamp exposure of Polysar S-50 compound to Polysar Krylene NS and new Polysar S-630. In each instance the left-hand panel is white compound, and the right-hand panel is the same compound lacquer-coated. The panels have been exposed under two 275-watt reflector sun lamps for 24 hours.

Polysar Krylene NS

NOW... all the inherent advantages of "hot" SBR *Plus light colour, non-staining, non-discolouring*

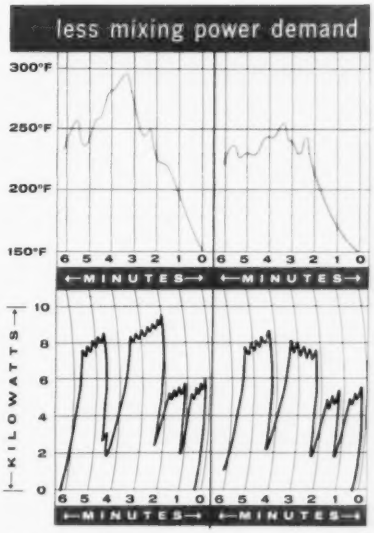
With the introduction of Polysar S-630, Polymer now brings you the easy processing, weathering resistance qualities of "hot" rubber plus new lightness of colour and improved non-staining, non-discolouring properties.

This new Polysar rubber thus brings substantial improvements to white or coloured tire sidewalls, non-staining carcass stocks for passenger tires and beadwire covering, conveyor and transmission belt carcasses; sponge products, such as rug underlay and weatherstrips; floor tiles; battery boxes and other ebonites; vacuum-moulded automobile floor mats, and cements.


improved weathering and ozone resistance
Depth of cracks after ozone exposure
Hot SBR with antiozidant
Cold SBR with antiozidant
Hot SBR without antiozidant
Cold SBR without antiozidant

The chart above shows the marked improvement in weathering and ozone resistance achieved by new Polysar S-630. The depth of cracks after ozone exposure in "hot" SBR compounds without antiozidant is almost two-thirds less than in similar compounds based on cold SBR. When both rubbers are protected with an antiozidant the depth of cracks developed in the "hot" SBR is less than half the depth of those recorded in cold SBR.

In the manufacture of high impact polystyrene, the same degree of improvement in impact resistance given by cold rubber is attainable with smaller quantities of Polysar S-630. In almost every product where colour stability is important, this new rubber brings new advantages.



The top chart records temperatures of cold and hot SBR compounds during Banbury mixing. The lower chart shows the corresponding power demands. Note the substantially lower temperatures and lower power demands of the Polysar S-630 compound.

Polysar S-630 is the subject of our Polysar Technical Report No. 7:12A. Write for a copy.

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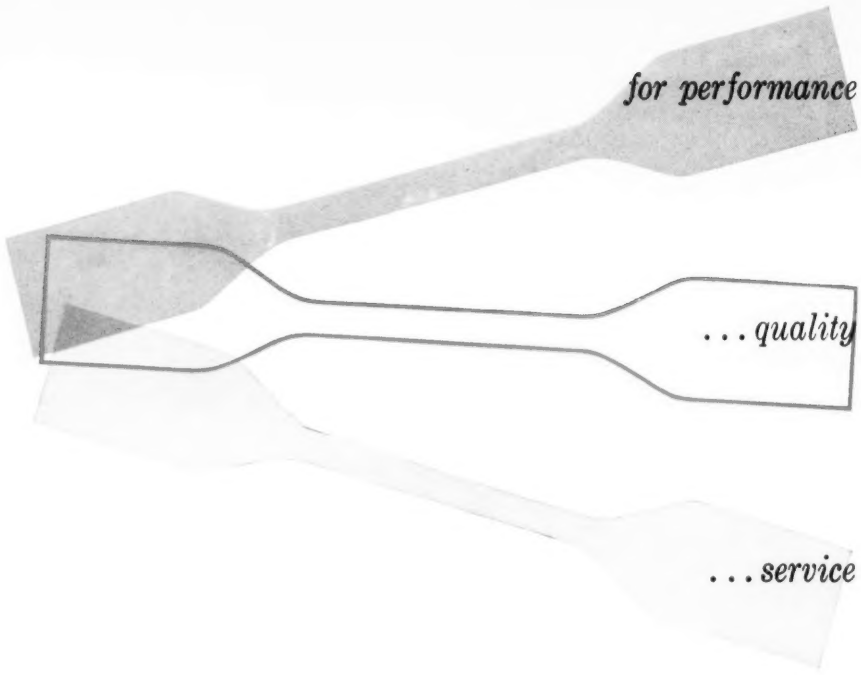

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Columbian Carbon To Build Plant in Italy

Columbian Carbon Co., New York, N. Y., will build a $6-million plant, with production facilities for more than 60 million pounds of carbon black annually, to supply the European Common Market. Construction of the plant will begin immediately in northern Italy, near Milan, and it is expected to be in full operation by early 1961. It will operate under the company name of Columbian Carbon Europa.

The move into the Common Market is part of the overall international expansion of Columbian Carbon, according to Lyle L. Shepard, president. The firm is now studying other likely locations for further world expansion.

Columbian Carbon Europa will be the largest initial carbon black facility, embodying modern American designs, to be built in Europe. Most of the material for the new plant's construction will come from Italy and the other Common Market nations. Italian construction companies will build the plant from Columbian Carbon designs.

Chairman of the board of directors for the new company is E. B. Brooks, vice president in charge of the parent company's carbon black and pigment division. Other members of the board, including strong representation from Italy, will be announced later.

Three grades of carbon will be produced in the new plant. Two are tread blacks, and one is carcass black.

Columbian Carbon has long been a leader in helping the rubber industry make better tires. Only recently it developed an improved method of adding carbon black to rubber, resulting in a substantial improvement in the tread wear of tires made from the improved product.

Peters Mfg. Co. Combines with Bishop

The Peters Mfg. Co., after 60 years of manufacturing in Wollaston, Mass., has transferred its operations to the Industrial Village, Cedar Grove, N. J., where it has combined with its parent company, the Bishop Mfg. Corp.

Peters Mfg. Co., producer of rubber compounds, rubber and plastic coated cable tapes, and rubber coated fabrics, will join with Bishop to occupy more than 40,000 square feet of factory space. Of this area 25,000 square feet comprise a newly constructed modern expansion, and 2,500 square feet are devoted to air-conditioned offices.

The research laboratories of Bishop have been expanded to include 700 feet of new construction to provide more facilities for the advanced research and technological developments of both companies.

Bishop's history dates back to 1847 when Samuel T. Armstrong was the first to import crude gutta percha into the United States, according to the company. Since then, Bishop has contributed many "firsts" to the electrical industry. Bishop's present products include gutta percha coated paper and aluminum foil for the spot crown industry, and synthetic rubber and plastic insulating tapes for the electrical field.

Ruberoid To Buy Mastic Tile Corp.

The Ruberoid Co., New York, N. Y., has made a joint announcement with The Mastic Tile Corp. of America that Ruberoid plans to acquire the net assets and business of Mastic Tile through the exchange of Ruberoid capital stock. A final agreement will be submitted for approval to the board of directors and stockholders of each company.

Mastic Tile was founded in 1945 to manufacture floor tile for residential, commercial, and industrial use. It is now a large producer of vinyl, vinyl-asbestos, asphalt and rubber tile and allied products, with plants at Newburgh, N. Y., Joliet, Ill., Houston, Tex., and Long Beach, Calif.

Included in the proposed transaction is Mastic Tile's interest in Cumberland Chemical Corp., formed last September and jointly owned by Mastic Tile and Air Reduction Co., Inc. The chemical company is constructing a plant at Calvert City, Ky., adjacent to other facilities of Air Reduction, for the production of various vinyl resins for use by Mastic Tile.

Ruberoid is a leading producer of asphalt and asbestos-cement building materials. The 73-year-old company presently operates 20 plants in 13 states.

When the acquisition is consummated, reported E. J. O'Leary, chairman and president of Ruberoid, Mastic Tile will be operated as a division of The Ruberoid Co., under the direction of S. Milstein and H. C. Hachmeister, president and executive vice president, respectively.

Holdings Highest In Rubber Companies

Common stocks held by investment companies indicated that tire and rubber companies are the segment with the highest dollar value in companies comprising the automotive group. These holdings for tire and rubber companies represent a dollar value of $298,290,000. The common stock holding with the largest dollar value is that of The Goodyear Tire & Rubber Co., with 51 investment companies holding shares valued at $135,056,000.

The list shows that 35 investment companies hold common shares of The Firestone Tire & Rubber Co., valued at $90,965,000; 35 hold shares of The B. F. Goodrich Co., valued at $48,632,000; 23 hold United States Rubber Co. shares, at $18,163,000. Eight investment companies hold shares of The General Tire & Rubber Co. with a value of $2,990,000; three hold Armstrong Rubber Co. shares valued at $1,634,000; two hold Lee Rubber & Tire Co. shares valued at $240,000; and one holds common shares of Mansfield Tire & Rubber Co. valued at $610,000.

In comparison, common shares of General Motors Corp. are held by more investment companies than those of any other company in the automotive group. Seventy-five companies hold common shares valued at $113,018,000, according to a study made by the National Association of Investment Cos.

Dow Badische To Make Acrylic Acid/Esters

Dow Badische Chemical Co. recently announced plans to produce acrylic acid and methyl, ethyl, butyl and other acrylic esters at a plant under construction near Freeport, Tex. Production is slated for January, 1960. The plant site is adjacent to The Dow Chemical Co.'s Texas division.

Dow Badische, capitalized at $6 million, is owned jointly by Dow and BASF Ovrzee, N. V., a subsidiary of Badische Anilin-& Soda-Fabrik AG of Ludwigshafen a. Rhein, Germany.

The acrylic acid will be manufactured as a 94% technical grade by a direct process developed by Badische and believed to be new to the U. S. chemical scene. Acrylic esters will be produced by esterification with methyl, ethyl, butyl, and other alcohols.

Production will be sold through The Dow Chemical Co. Sample quantities are available through the Dow plastics sales department, Midland, Mich.

It is expected that the technical grade of acrylic acid will be sold for use as an intermediate in the production of higher acrylic esters, normally not available on the commercial market.

Other markets for acrylic acid and the esters will be paint manufacturing, particularly in outdoor-type latex paints, synthetic fibers, plastics and resins, leather, textile and paper finishing, and rubber manufacture.

Additional markets are expected to develop as industry investigates uses of the specials esters.

Earle B. Barnes, director of organic research for the Texas division of Dow, is president of Dow Badische Chemical Co. Tim Toepel, from Badische, Ludwigshafen, is vice president and general manager.

Texas Butadiene Signs Hess To Run Terminal

Texas Butadiene & Chemical Corp. and Hess Terminal Corp., both of Houston, Tex., have signed a contract to cover the erection and operation by Hess at its terminal on the Houston Ship Channel of the largest specially designed butadiene terminal ever constructed. The terminal will be used solely by Texas Butadiene for storage of butadiene destined for both domestic and overseas customers.

The terminal will consist of two 40,000-barrel ellipsoids each having a capacity of 4,000 tons. Butadiene will be delivered to the terminal by an 11-mile pipeline from TB&C's Channelview, Tex., plant. Before flowing to storage the butadiene will be cooled to 35° F.

Connecting pipelines will enable loading of ocean-going ships at a rate in excess of 250 tons per hour. Tank trucks and tank cars also may be loaded from the terminal.

It is expected that at the 35° F. specification butadiene may be stored for periods in excess of six months without deterioration of quality. An additional advantage of refrigerated storage is the versatility obtained in permitting the use of either pressure-type vessels carrying the product at ambient temperatures or new-type refrigerated tankers.

Construction of the terminal is now under way, with completion slated for October. The 8,000 tons of butadiene which this terminal is capable of storing, plus the more than 4,000 tons of storage capacity at TB&C's plant site, is said to give the company the largest butadiene storage capacity in the world.

NEWS BRIEFS

MICHIGAN CHEMICAL CORP., St. Louis, Mich., has announced start-up of its new magnesium oxide plant at Port St. Joe, Fla. After the essential in-process build-up, finished products will reach customers early in October. The new plant will provide industry with high-purity chemical and refractory grades of magnesium oxide for use in manufacturing basic brick and other refractory products, rubber and neoprene, paper, textiles, insulation and building products, ceramics, catalysts, and for many applications in chemical processes.

THE DOW CORNING CO., Midland, Mich., has developed a new vinyl copolymer latex, designated Experimental Latex X-2726, which is said to have exceptional heat and light stability for use in textile coating applications. Performance tests have shown the heat stability of the new material to be 50% better than that of the best commercial vinyl chloride-type latices previously available. Also, Atlas FadeOmeter tests have shown improved light stability by a 20-30% margin. This latex shows promise for coatings for shade cloth, wallboard, rubber, book fabrics, foldable table coverings, fabric wall coverings, and in linoleum wear layers.

THE GENERAL TIRE & RUBBER CO. has completed a $350,000, 50% expansion of its facilities for the production of paint, paper, and textile latices at Mogadore, O. The product, a styrene-butadiene latex called Gen-Flo, is used in rubber-base latex paints, in new, improved coated papers as a binder and reinforcing agent, and in the textile industry in rug backing, textile printing inks, and in the treatment of upholstery materials. The additional facilities, which include a complete new glass-lined reactor system, also provides for production of styrene-acrylic latices, called Acri-Flo, for newly developed exterior latex paints. General Tire has also augmented its tank-car fleet to take care of the additional production.

E. I. DU PONT DE NEMOURS & CO., INC., elastomer chemicals department, Wilmington, Del., will package a number of its rubber chemicals in paperboard cartons instead of fiber drums, starting this summer. Chemicals being changed are Heliozone, RPA No. 2, Thionex, Thiuram M, and all colors. The new 50-pound packages as against the 175-pound drums, should help purchasers reduce handling costs and will permit storage of 25% more material in the same area.

CONTINENTAL CARBON CO. is expanding its carbon black plant at Lake Charles, La., at a cost of more than $2 million to increase the facility's annual capacity from 45 million to 70 million pounds of high-abrasive carbon black. Fish Engineering Co., Houston, Tex., has started construction on the project, with completion expected by the end of this year. This carbon black facility, built in 1951, will continue to receive its raw material from Continental Oil Co.'s refinery at Lake Charles. The increased output will be distributed through Witco Chemical Co. primarily to synthetic rubber manufacturers in the Gulf Coast area.

ARCHER - DANIELS - MIDLAND CO., Minneapolis, Minn., has developed a new polymeric plasticizer, Admex 770, that is said to impart a high degree of permanence to polyvinyl chloride calendered film and sheeting. Admex 770 is described as a primary plasticizer with good low-temperature flexibility and excellent resistance to extraction and migration. It is very light in color, has a very low odor level, and does not crystalize or form a precipitate when exposed as a liquid to low temperatures. It is recommended for use in organosol cloth coatings and in calendered film and sheeting for electrical tape and upholstery applications.

ACE RUBBER PRODUCTS, INC., Akron, O., and URWA Local No. 55 concluded contract negotiations on June 19 with the signing of a new contract, covering a two-year period. The parties involved expressed satisfaction with the new contract, which covered some wage inequity adjustments and revisions in work arrangements. The firm manufactures original-equipment and replacement rubber mats for automobiles and a variety of rolling mats for residential and industrial use. It employs about 150 people and is currently building a 10,000-square-foot addition to its plant.

THE CONNECTICUT HARD RUBBER CO., New Haven, Conn., has developed a new fluoro-elastomer cement said to be resistant to fuels and chemicals up to temperatures of 500° F. Known as COHRlastic C-328 RTV, the new cement vulcanizes at room temperatures and can be used to bond Viton rubber to itself and Viton to metal. The cement is a two-part system consisting of a 35% solution of cement and a non-volatile room-temperature activating catalyst. This cement is recommended as a field repair cement for Viton fuel cells and as coating compound for lining tanks and similar equipment to prevent chemical corrosion. C-328 RTV is presently available in a compact four-ounce sample kit with catalyst for $6.

THE SKINNER ENGINE CO., Erie, Pa., has purchased the power equipment and process machinery divisions of the Troy Engine & Machine Co., Troy, Pa. Skinner Engine, manufacturer of "Unaflow" steam engines, exclusive supplier of parts and service for Elliott (Ridgeway), Chuse, and Ames steam engines, and rebuilder of Banbury bodies for the rubber industry, became exclusive supplier of all new equipment, together with parts and service for products formerly manufactured by Troy Engine & Machine. Products in the newly acquired line include Troy engines, Troy-Engberg engines, American Blower engines, Whitin engines, Erie Ball engines, and Troy processing equipment.

THE GOODYEAR TIRE & RUBBER CO., Akron O., has introduced five gold metallics and one all-copper style to its line of all-vinyl Evergleam counter topping. Also, a new terrazzo styled pink and white on charcoal is being added to its line of NoScrub all-vinyl flooring line. The new products made their commercial debuts at the summer flooring market in Chicago which opened for a week's run in the Merchandise Mart, June 15.

MONSANTO CHEMICAL CO. has completed the expansion of silica production facilities at its Everett, Mass., plant. Operated by the company's inorganic chemicals division, the silica plant produces the division's Sytons (colloidal dispersions of silica in water) and Santocels (silica aerogels). The Syton dispersions are used in various products, including the production of rubber adhesives. The Santocel products are used in thermal insulation applications.

UNITED STATES RUBBER CO., New York, N. Y., has developed a synthetic rubber tape, U-100 sealing tape, reinforced with nylon fibers, for curtain wall applications. Savings in manhours in construction and maintenance have resulted from use of the new tape, which has eliminated the use of screws for exterior wall panels. The tape's long trial testing program has uncovered many outstanding characteristics, such as resistance to oxidizing and hardening, virtually permanent flexibility, and excellent adhesion to a variety of surfaces, including glass, aluminum, and brass. U-100 is said to have outstanding weathering and ozone properties. Tests have demonstrated that it remains flexible at —76° F., stable at continuous temperatures up to 150° F., and it can withstand intermittent readings up to 300° F. without ill effect. Weatherometer testing and actual weathering under extreme conditions of sunlight, snow, rain, and ice produced no appreciable loss in flexibility, or drying, shrinking, or fatigue.

New company symbol of Harwick Standard Chemical Co.

HARWICK STANDARD CHEMICAL CO., Akron, O., supplier of chemicals to the rubber and plastic industries, has announced that it will begin using a new company identification symbol in the near future. The change was a move to intensify the company image and to meet constantly increasing demands for easier identification, according to D. F. Behney, executive vice president of Harwick.

ARMOUR & CO. has formed a new group, Armour Industrial Chemical Co., located at 110 N. Wacker Dr., Chicago, Ill. The new company, under the direction of M. E. Lewis, general manager, comprises the fatty acids, fatty nitrogen derivatives, and the ammonia divisions. R. S. Passmore will continue as ammonia division manager, and P. W. Fulford will remain in charge of ammonia sales. B. W. Graham continues as director of sales for the fatty acid and derivatives divisions.

THE WARE CHEMICAL CORP., Westport, Conn., has appointed R. M. Ferguson & Co. its agent in Canada for its line of "Prespersions," and R. E. Carroll, Inc., Trenton, N. J., as representative in the middle Atlantic states.

STURTEVANT MILL CO., Dorchester, Mass., has fabricated and shipped a 42-inch-diameter Micronizer fluid energy mill, said to be the largest ever manufactured. The mill increases grinding capacity 50% over the 36-inch unit. It has a maximum capacity of from 750 pounds to more than three tons per hour, depending upon material and fineness desired. This mill will be employed in the grinding of titanium dioxide to the unmeasurable micron and sub-micron range.

THE GOODYEAR TIRE & RUBBER CO. has added a three-mile gravel road to its multi-million dollar tire testing facilities near San Angelo, Tex. The gravel oval is constructed of variegated stone, including much tire-slicing flint. The 32-foot ditch-to-ditch roadway was designed from Michigan Highway department standards, which are considered typical of rural roads. The new road will be used for field research experiments on wearing ability of new rubber compounds for passenger and truck tires. Goodyear is also planning a 20-mile winding road to duplicate regular two-lane highways.

E. I. DU PONT DE NEMOURS & CO., INC., elastomers laboratory, Chestnut Run, Del., has achieved a safety record believed to be unique in industry—30 years without a single time-losing injury on the job. Since July 1, 1929, when the laboratory first opened at Deepwater Point, N. J., it has operated more than 5.1 million manhours without a time-losing injury. This is the longest injury-free time span recorded by any unit of Du Pont, which leads industry with 14 awards of honor from the National Safety Council.

PAWLING RUBBER CORP., Pawling, N. Y., has supplied specialized rubber component parts for the Navy's first nuclear powered submarine that fires fleet ballistic missiles. The new Navy submarine, the *George Washington*, was launched recently at Groton, Conn. It will fire the Polaris missile from submerged positions at sea.

THE GOODYEAR TIRE & RUBBER CO.'S printers' supplies department, New Bedford, Mass., has developed what is said to be the first two-sided offset blanket for the printing industry. Both sides of the new blanket are to be used alternatively to cut fatigue, thus extending blanket life more than 1½ times normal. The two-sided blanket is only one-third higher in price and is being produced by the company's new micro-texturing process and marketed with the trade name Hi-Fi in 0.065 and 0.075 gages.

FIRESTONE SYNTHETIC RUBBER & LATEX CO., Akron, O., has opened a new sales office and two new warehouses. The sales office and a warehouse are in Philadelphia, Pa., the former at Firestone's district office headquarters, 1620 S. 49th St., the latter at 81 Fairmount Ave. W. T. Brahmstedt, former sales representative at the Fall River, Mass., sales office, has been named representative in Philadelphia. The other new warehouse is in Cambridge, Mass., at 134 Massachusetts Ave.

THE DAYTON RUBBER CO., Dayton O., has announced that its Daycollan urethane material may be used in 1960 automobiles. A thin layer of cast urethane between two metal sleeves creates a drive shaft torsion elastic spring that will transmit full engine torque, yet dampen vibration and cushion shock. Formed from liquid components, the material is poured into a mold, sets up, and forms a permanent bond with any surface. In repeated torque tests, the metal broke down before the Daycollan would shear. The outstanding adhesive qualities of cast urethane made possible a much smaller drive shaft coupling, leading to smaller drive shaft humps in future cars.

News Briefs

ETHYL CORP., New York, N. Y., has discovered and developed eight new antioxidants which are now available in commercial or development quantities. All of the new agents are based on Ethyl's ortho-alkylation process, which is responsible for the first commercial introduction of many derivatives of phenol and aniline. The parent compound for most of the antioxidants is known chemically as 2,6-di- *tert* butylphenol. More than 100 companies in the oil, rubber, and plastics industries are pushing evaluation studies on the new compounds which thus far have been found to be most promising. Cracking and degradation of natural and synthetic rubbers are reduced, and durability is increased in such finished goods as tires, foam mattresses, hose, insulation, and industrial belting, by the use of these materials, it is said.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., is marketing an improved version of its E. C. Cord Green Seal V-belt said to have a 40% increase in horsepower rating. The new belts will allow design of new drives using one-third fewer belts and sheave grooves. Besides savings in initial belt and sheave costs, drives can be designed for installation in more limited space. The new belts are being produced in compass cord construction up to 120 inches in length and multiple-ply construction for longer belts. Both types are available in oil-and heat-resisting construction with static conduction properties, according to Goodyear.

CONNECTICUT SAFETY SOCIETY during its annual meeting recently at Bridgeport, Conn., presented its Distinguished Service Award to Earl C. Shedd, safety supervisor of the Naugatuck, Conn., footwear plant of United States Rubber Co. Shedd was honored for directing a program that led to the establishment of a new world's safety record for all manufacturing plants in the rubber industry. From September, 1957, to April, 1959, the 5,000 employes of the Naugatuck plant worked a total of 13,970,161 manhours without a disabling injury or lost-time accident. The previous record had been 11,400,483 man-hours.

MANHATTAN RUBBER DIVISION, Raybestos-Manhattan, Inc., Passaic, N. J., is now offering a Homoflex Creamery-Packers hose which features a soft, steam-resistant, oil- and grease-proof nozzle for low-pressure steam cleaning, or hot and cold water rinsing in dairies, creameries, packing plants, and canneries. The smooth white neoprene cover will withstand animal and butter fats, fish and vegetable oils. The hose comes in sizes from ½-inch to 1½ inches for use up to 250 psi. working pressure, depending on size.

PICKER X-RAY CORP., Cleveland, O., has opened a new $1 million research center there, said to be one of the most completely equipped radioisotope laboratories in the nation for commercial use and possibly the largest isotope encapsulation point for industrial and medical users. The center was dedicated by Dr. Paul C. Abersold, Atomic Energy Commission, when he lowered the first container of Cesium 137 to be received at the radioisotope laboratory. Picker is the first company to process and ship cobalt 60 and other isotopes since the AEC announced its decision to discontinue encapsulation for commercial users. The center is capable of encapsulating up to one million curies of cobalt 60. The center's industrial radiography section will have three major purposes: to develop radiographic techniques for inspection of samples sent in by industry, to research and develop new techniques and uses for radiographic equipment, and to train industrial radiography users.

THE PIONEER RUBBER CO., Willard, O., is providing a custom-order service through its industrial glove division. Workers with unusual fitting problems can obtain specially made gloves that provide freedom of movement and maximum sensitivity regardless of the unique size or shape of their hands. Special molds are made from outline drawings or plaster of paris casts of the worker's hands. The gloves are then made on these molds. There is a nominal fee for the design and preparation of the special mold, but the custom-made gloves are supplied at regular cost.

BRISTOL MFG. CORP., Bristol, R. I., has purchased outright the trade name "Thermoboot," formerly owned by Techno Efficiency Council, Inc., Brooklyn, N. Y. Henceforth the name will appear on all high-grade insulated waterproof footwear manufactured by Bristol. Bristol working with representatives of Techno Efficiency Council, developed the original "Thermoboot" for use by the Armed Forces in combatting cold-weather conditions in Korea.

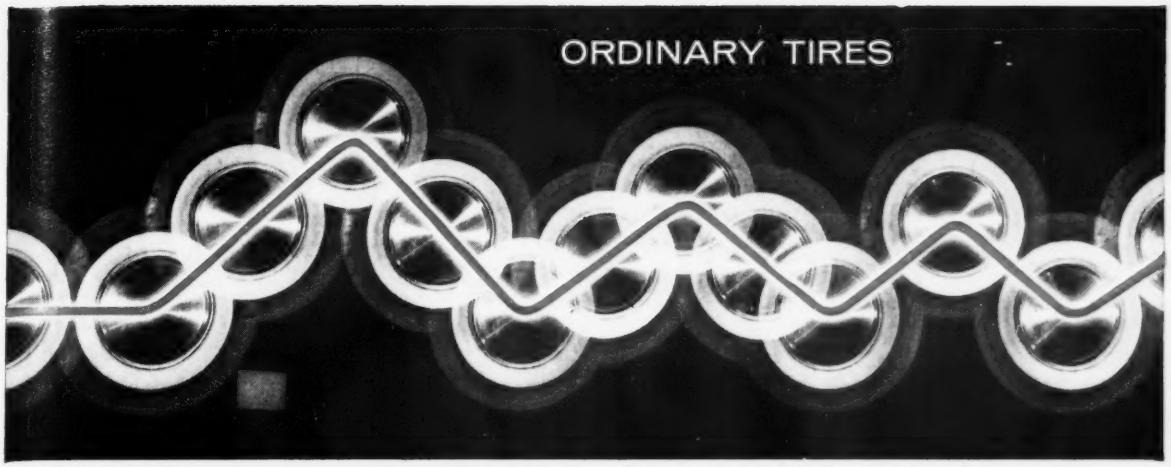
THE GOODYEAR TIRE & RUBBER CO., Akron, O., has developed a new rubber fender for trucks, truck docks, small marine vessels, and industrial applications. Called the M-4, the new fender is designed to absorb any shock load created by a docking truck or vessel. Built with a flat base, tapered sides, and rounded front, the M-4 can be installed horizontally, vertically, or diagonally. When mounted, all hardware is protected by the fender. It can be supplied in lengths up to 19 feet for installation on wood, concrete, or steel. Fender base is 4½ inches wide, and height is 3¾ inches.

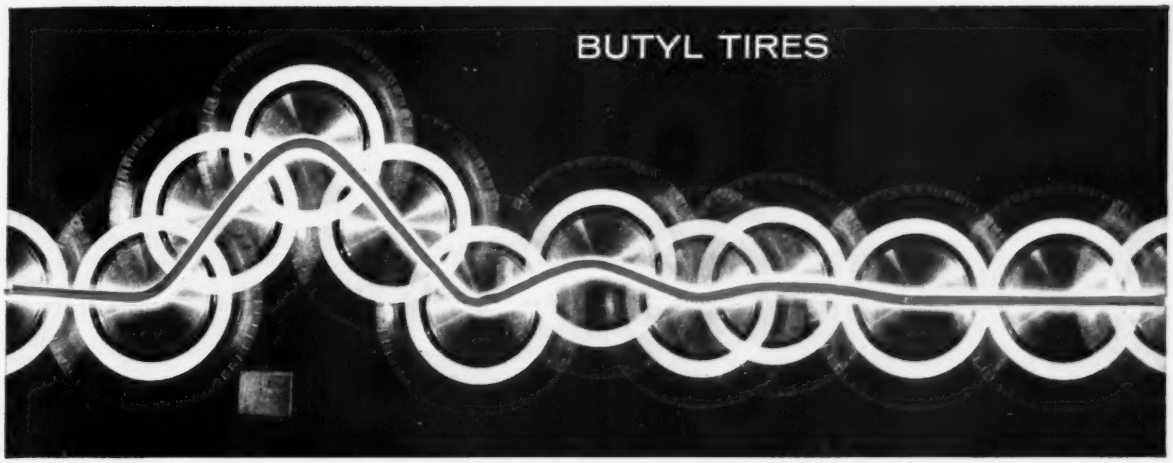
B. F. GOODRICH AVIATION PRODUCTS, a division of The B. F. Goodrich Co., Akron, O., has developed rubber-coated nylon blankets to protect wing-tip fuel tanks against lightning damage on the Air Force RC-121D early warning plane. Tip tanks on the Lockheed Super Constellations (RC-121D) are 18.6 feet long and 3.5 feet in diameter—coming to sharp points at both ends. The BFG blankets, made of natural rubber, nylon, and neoprene are a three-ply construction. They are applied to the aluminum tank surface with a special adhesive that secures a permanent bond. Six static-conducting metal fin-like strips, extending the length of the tank from tip to tip, are evenly spaced around the circumference. A long pointed probe at each end of the tank also serves as a lightning arrestor, and the aft probe dissipates the electric charge into the atmosphere.

THIOKOL CHEMICAL CORP., Trenton, N. J., has shipped nearly 50,000 pounds of polysulfide rubber water dispersion to Greece. Representing one of the largest single shipments abroad of the product—trade named Thiokol WD-6—it will be used to protect fuels stored underground for use in the NATO program. It will be used to coat underground concrete storage tanks, giving protection from contamination of fuels and preventing leaks for approximately 15 years. Application of the coatings in this project will be supervised by Armen Yazujian, a product manager for Thiokol.

UNITED STATES RUBBER CO.'S Naugatuck Chemical Division, Naugatuck, Conn., has developed a specially formulated liquid rubber, called Laticrete, for use as a binder in cement used to install glass mosaic tile. The new setting technique, one of the first major changes in masonry art, was developed by Blakely Granite Co., Indianapolis, Ind. The liquid rubber replaces water as a binder in the cement with which the tiles are installed. It speeds up the cure of the cement, increases the cement's adhesive qualities, and also makes it waterproof. Water does not penetrate the rubberized cement to loosen the tiles, or cause them to pop off as trapped water freezes during the winter.

THE GOODYEAR TIRE & RUBBER CO., Akron, O., reports that its pneumatic ship fenders have been used to protect the hulls of U. S. Navy destroyers during their trip through the locks of the St. Lawrence Seaway recently. The Navy ordered 64 of the nylon cord and rubber constructed fenders to use on 16 destroyers. The Atlantic-based destroyers are part of a 28-ship flotilla that is participating in "Operations Inland Sea" this summer.





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Save costly design improvements

Because Butyl absorbs shock better than any other rubber, dramatic improvements in suspension and silence of ride are now made possible with revolutionary Butyl tires. Comments from design engineers in Detroit indicate Butyl tires will eliminate, or at least minimize major engineering changes to overcome vibration and noise.

And what a powerful new selling feature! Butyl tires give such remarkable road traction, they refuse to squeal, at any corner, at any speed – even on hot pavements. And they stop up to 30% quicker – even stop faster on wet surfaces than ordinary tires do on dry.

In addition to 100 other Butyl parts, tomorrow's best-selling cars will have tires of Butyl. One short demonstration ride can prove that any car equipped with Butyl tires gives traction, safety, and silence never experienced before. Butyl tires are now available to the motoring public. Let us show you how Butyl can help make better rubber products.

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NEWS about PEOPLE

GODFREY L. CABOT, INC., has moved to its new home office headquarters at 125 High St., Boston 10, Mass. The Cabot firm is the first major tenant in the Travelers Insurance Co. building, newest and most modern office building to grace Boston's skyline. The new Cabot offices are thoroughly modern, designed for greatest employe comfort and efficiency. All offices are equipped with combination prismatic lens and diffuser panel lighting which gives even light in all areas with minimum glare and reflection. Circulating air-conditioning, either hot or cold, can be controlled to individual preference in each office. For the past 25 of 77 years in business, Cabot headquarters were at the Columbian National Life Insurance Building, 77 Franklin St. The new address will be the home office headquarters for all Cabot interests.

THE B. F. GOODRICH TIRE CO., Akron, O., in its recent advertising has indicated that $12.95 or third-line tires are not designed for safe turnpike driving. These tires are designed for normal city and country driving, not for long periods at sustained high speeds on turnpikes. The tire company recommends its B. F. Goodrich Silvertown tires to meet safely the requirements of turnpike driving.

PACIFIC MOULDED PRODUCTS CO., Los Angeles, Calif., recently acquired by purchase of all the outstanding stock, W. B. Elfstrom, Inc., a local firm. Pacific Moulded Products makes mechanical goods for the aircraft, electronic, and appliance industries. Elfstrom, established in 1932, manufactures and markets a complete line of rubber replacement service parts for all leading brands of commercial and household washing machines.

THIOKOL CHEMICAL CORP.'S "Recruit" solid propellant rocket engine recently propelled a rocket sled at Edward's Air Force Base at a new world speed record for a dual-rail vehicle, in a captive speed test. It obtained a speed of 2,075 miles per hour during a routine test recently, reaching a maximum velocity of Mach 2.66, more than 2½ times the speed of sound. The Air Force engineers believe they can achieve speeds of Mach 4 in the near future.

Walter M. Burgess has been appointed district manager of the northeast chemical district of McKesson & Robbins, Inc., New York, N. Y. Burgess, who joined the firm in 1943, has served as assistant district manager for the past five years. His district includes eastern New York State, New Jersey, Connecticut.

John C. Lukman becomes works manager of the Borden Chemical Co.'s expanding polyvinyl alcohol operations in Leominster, Mass. Since he joined Borden in 1955 he has been development manager at the Leominster operations. In his new position he will be responsible for development, technical service, and production operations not only of the present plant, but also of a second PVA plant now under construction.

Robert E. Jeffery has been named controller of The Garlock Packing Co., Palmyra, N. Y. A veteran of 28 years with the company, his last assignment was manager of the systems and procedures department of the finance division.

Gene F. Metzinger has been named western district manager for Shell Chemical Corp.'s newly organized plastics and resins division. The western sales district headquarters, located at 10642 Downey Ave., Downey, Calif., serves 11 western states and is one of four district offices set up in the United States to serve the new division. Two salesmen, **R. M. Maybee** and **H. M. Van Bemmelen,** will serve the Southern California area. **R. C. Brown** will direct sales in San Francisco and the Pacific Northwest.

A. L. Schriml becomes product sales manager for the new line of Dayton Poly-V drives, according to R. G. Burson, vice president and sales manager for Dayton Industrial Products Co., a division of The Dayton Rubber Co., Dayton, O.

Howard W. Smith, president of Pawling Rubber Corp., Pawling, N. Y., has been elected president of the Mid-Hudson Industrial Association, Poughkeepsie, N. Y., according to Benjamin J. Van Wickler, executive secretary of the Association.

John F. McCarthy becomes manager of passenger tire sales for The General Tire & Rubber Co.'s Boston division, Boston, Mass. He has been Portland, Me., and, most recently, Boston territory salesman for the Boston division.

George A. Hobach, formerly with A. C. Mueller Co., is now special representative in the Akron, O., office of Tyrex, Inc. He joins **George M. Sprowls,** for many years with Goodyear Tire & Rubber Co., who is new technical director of Tyrex, Inc., with offices in the First National Tower Building, Akron.

Carl E. Frick, technical manager of the Dutch Brand division of Johns-Manville Corp., Chicago, Ill., was recently honored at a testimonial dinner at the time of his retirement. With the company since 1923, Dr. Frick's most recent responsibilities included new product development, technical service to customers, quality control, and liaison with the Dutch Brand and central plastics research department at the J-M research and engineering center, Manville, N. J.

John G. Howley and **Charles F. Donovan** have been appointed sales representatives for industrial adhesives, industrial sales division, United Shoe Machinery Corp., Boston, Mass. Howley will handle both the Bostik and Thermogrip lines of industrial adhesives manufactured by United's subsidiary, B. B. Chemical Co. His territory will be Pennsylvania and Maryland. Donovan will specialize in Bostik adhesives and will cover the New England area plus special assignments.

Thomas W. Blazey has been named assistant controller of The B. F. Goodrich Co., Akron, O. He joined BFG in the controller's division in 1946. In 1950 he was appointed manager of factory accounting and in 1953 was named office manager of the company's Los Angeles plant. He became manager of costs and interplant accounting for B. F. Goodrich Tire Co. in 1956, and, in 1957 was named chief accountant in that company.

Norman E. Dotzenroth, assistant manager of purchases, B. F. Goodrich Canada, Ltd., Kitchener, Ont., Canada, was elected president of the Central Ontario Association of Purchasing Agents at their recent annual meeting at Leisure Lodge, Preston, Ont.

MORE TIRE POWER Proven by test

Proved best at high speeds† In long distance driving tests over hot, abrasive pavement, at speeds up to 128 miles per hour, TYREX viscose tire cord averaged 26% more tread mileage than nylon—showed 77% less body growth—and 60% less tread chunkout.

Proved best for impact resistance† In test runs over one of Nevada's toughest roads, nylon cord tires and tires made with TYREX viscose tire cord slammed into rock outcroppings at speeds up to 45 mph. Result: tires with TYREX viscose cord sustained up to 60% fewer bruise breaks!

Proved best for city driving† Tested on New York City taxi fleets, in 16 million miles of rough and tumble midtown driving, tires made with TYREX viscose cord averaged 11% more mileage on their original treads than nylon. 96% proved suitable for recapping, and many are now running on their third recap.

Proved best for trucks† On trucks gradually overloaded from 20-to-40-to-50% above Tire and Rim standards . . . on a long haul totaling 30,000 miles over a torrid Texas road (139° in places), *10 ply* tires of TYREX viscose cord showed 21.7% better tread wear than *12 ply* tires made with nylon—and were recappable. Also tires with TYREX viscose cord ran 10% cooler than the nylon with negligible growth (tires with nylon grew up to 41.5% more!).

Proved best tire cord of all for strength, stability, longer wear. Others can say what they will. But proof of premium quality belongs to TYREX viscose tire cord. In hundreds of torturous laboratory and field tests made with other tire cords, TYREX viscose cord has consistently and conclusively won out as the toughest and safest of all—with the full tire power needed for today's more powerful cars. **And remember this:** all new cars come factory equipped with tires containing TYREX viscose cord.

† In tests conducted by independent testing companies.

Meet today's demand for more tire power with TYREX viscose tire cord—the toughest tire cord ever made—as proven by test. Tires containing this superior new cord run cooler, smoother, quieter—longer, and safer—without flat spotting.

TYREX INC., EMPIRE STATE BLDG., NEW YORK 1, N.Y.

**TYREX is a certification mark of Tyrex Inc., for viscose tire yarn and cord. TYREX viscose tire cord and yarn are also produced and available in Canada.*

News about People

G. F. Halfacre

F. Floren

George F. Halfacre has been elected vice president in charge of manufacturing of The New Jersey Zinc Co., New York, N. Y., succeeding **Philip M. Ginder,** who has retired. Halfacre, with the company since 1918, has held successively the positions of assistant chief and chief of the zinc slab department, superintendent of the West Plant, Palmerton, Pa., assistant general superintendent, general superintendent of the Palmerton plant and manager of manufacturing.

Arthur W. Bruce, comptroller, Dominion Rubber Co., Ltd., Montreal, P.Q., Canada; **Lee L. Keener,** treasurer, B. F. Goodrich Canada, Ltd., Kitchener, Ont., Canada; and **Harold E. Anderson,** assistant comptroller, The Eagle-Picher Co., Cincinnati, O., have been elected to membership in the Controllers Institute of America, New York, N. Y.

Herbert S. Parham has been appointed director of marketing for Monsanto Chemcial Co.'s organic chemicals division. He replaces **Arthur P. Kroeger,** now assistant general manager of the division, according to **Robert M. Morris,** Monsanto vice president and general manager of the division.

Robert W. Grimble has been assigned the newly created post of assistant director of manufacture, elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Since he joined the company in 1946 he has held various positions, most recently as production manager in the manufacturing division (since 1957).

J. Howard Olehy was elected vice president of Petroleum Chemicals, Inc., New Orleans, La., at a recent meeting of the executive committee, according to **Bruce K. Brown,** president. Olehy will headquarter at the Lake Charles, La., manufacturing facilities, continuing to report to **F. M. Simpson,** executive vice president. Accompanying Olehy in the move to Lake Charles are **L. E. Taylor,** chief engineer, and **Paul Schaeffer,** purchasing agent.

Frank Floren has been named to head the new West Coast district office of Enjay Co., Inc., at 3325 Wilshire Blvd., Los Angeles, Calif. **Gene Huxley,** who has been handling polymer sales in Los Angeles, has been assigned to Chicago as polymer sales supervisor in the Chicago district. Floren, who joined the company's technical service division in 1948, transferred to industrial sales with an affiliated company in New York State in 1951. He joined the Butyl division in 1955 and moved to the Chicago office as a technical representative that same year.

G. Redlich has been named to the newly created position of manager, economics and development, for Polymer Corp., Ltd., Sarnia, Ont., Canada. He will coordinate the company's business development and planning effort with existing staff services. **D. J. Wormith** has been appointed manager, planning and development department, and **W. R. Carson,** manager, operations analysis department.

G. Redlich

R. K. Dix

Robert K. Dix has been elected a vice president of Enjay Co., Inc., New York, N. Y., marketer of petrochemicals. He succeeds **H. J. Rose,** who resigned recently to become a vice president of Esso Export Corp., international affiliate of Standard Oil Co. (N. J.) Dix, formerly assistant general manager of Esso Standard's Baton Rouge, La., refinery, will head Enjay's products management department. This department includes four divisions — butyl, plastics, chemicals, and additives. The Enjay Laboratories are in Linden, N. J. Dix, however, will headquarter in New York.

Walter R. Hausch has been appointed manager of the adhesives development department, Xylos Rubber Co., a division of The Firestone Tire & Rubber Co., Akron, O. **Don E. Kory,** who received his Master's degree in protective coatings from the University of Michigan in 1951, also joins the Xylos staff. Dr. Hausch transferred to Xylos from the parent company in 1956 to work on the development of various types of Loxite adhesives. In his new position, he will be responsible for the development of new adhesives and the control testing of current production.

Ray P. Dinsmore, internationally known authority on natural and synthetic rubber and vice president of research and development for The Goodyear Tire & Rubber Co., observed his forty-fifth year with the Akron, O., firm in July. His long tenure with the firm and many contributions to the rubber industry were recognized during a meeting of Goodyear directors when he was presented a 45-year service emblem by E. J. Thomas, board chairman. Dr. Dinsmore's career in research has been highlighted by the Colwyn Gold Medal for 1947, awarded by the Institution of the Rubber Industry for his work in synthetic rubber research, its development and application to products. He also was selected to receive the Charles Goodyear Medal for 1955 by the Rubber Division of the American Chemical Society. As assistant deputy rubber director for the United States during World War II, Dr. Dinsmore organized and directed research and development work on synthetic rubber for the government and coordinated the activities of both industrial and university laboratories.

C. W. Ebert has been appointed vice president and treasurer of The Poly Products Co., Spartanburg, S. C., a subsidiary of The Faultless Rubber Co. Formerly secretary and treasurer of Faultless, he will continue as secretary and as a member of the board of directors of the parent company. **Harold L. Albrecht,** formerly audit supervisor of the Cleveland office of Ernst & Ernst, joins Faultless as treasurer.

William H. Heinlen has been named marketing manager for the international department, B. F. Goodrich Chemical Co., Cleveland, O. Previously he had served as acting manager of international sales for the company. He will continue to report to **Robert P. Kenney,** director of international activities. Heinlen joined The B. F. Goodrich Co., in 1942 and in 1952 was transferred to BFG Chemical's international sales department in a technical service capacity. He was made technical service manager of the department in 1956 and was named acting sales manager of the department early in 1958.

Wm. H. Heinlen

W. R. Hausch

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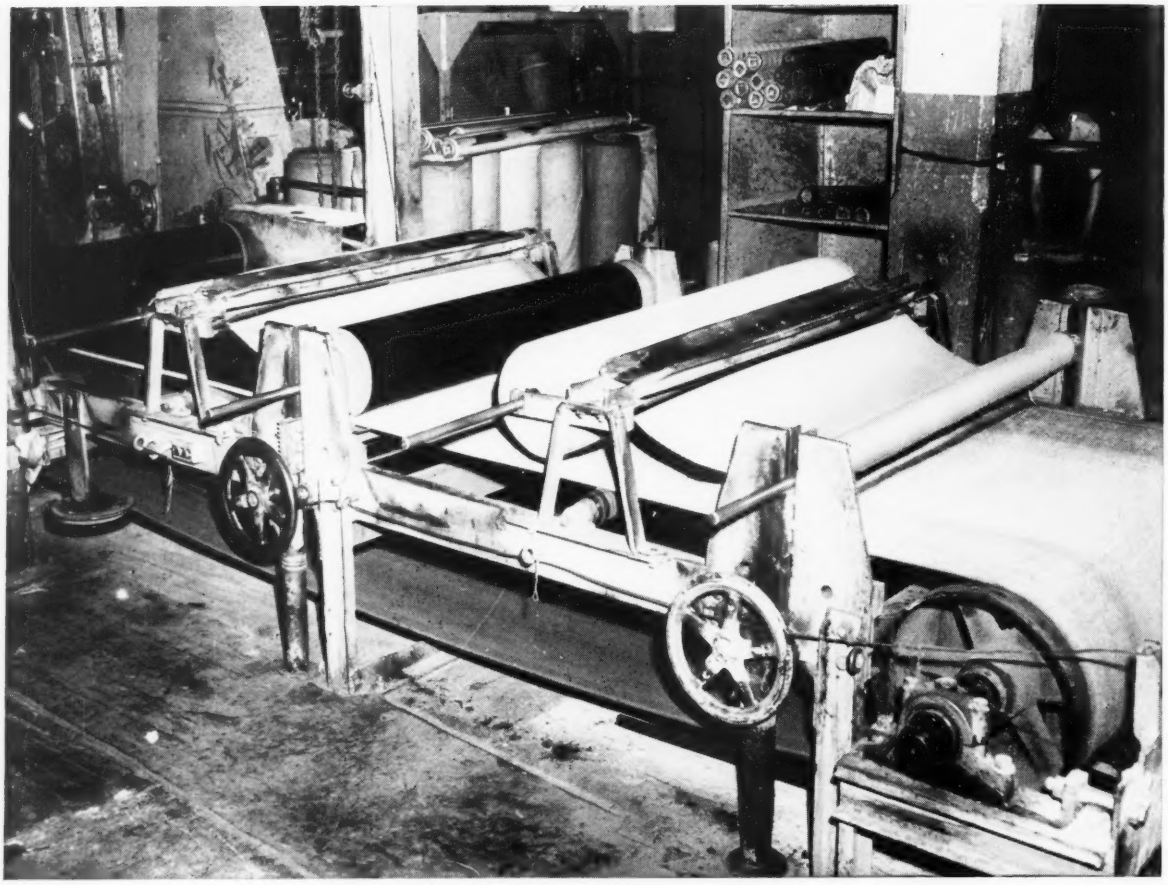

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R. L. Checkel

Wm. J. Schrantz

Kenneth B. Davis, supervisor of wage and salary administration for B. F. Goodrich Chemical Co., has been appointed personnel manager of B. F. Goodrich Do Brasil, a newly created BFG foreign subsidiary. Davis will set up a personnel program for the company's new tire, tube, and industrial products plant now under construction at Campinas, Brazil. Before going to his present position in Cleveland, O., he was safety engineer at the company's Avon Lake plant and manager of industrial relations at Institute, W. Va.

Daniel H. Handy, recently retired treasurer of the Lee Rubber & Tire Corp., Conshohocken, Pa., was honored on July 13 at a testimonial dinner attended by more than 200 friends, relatives, executives, and employes. Handy, who had been treasurer for the past five years, joined Lee in February, 1927, when he was appointed bookkeeping supervisor. In 1937 he advanced to chief accountant and in 1946 he was appointed assistant secretary. He was later advanced to the position of assistant to the treasurer and controller.

Charles J. Benner has been named chief engineer for the automotive sales department, tire division, United States Rubber Co., Detroit, Mich. Benner, who has been with the rubber company for 20 years with most of this time spent in Detroit, will headquarter in the New Center Building there. He will be in charge of tire engineering in connection with sales and servicing of original equipment tire accounts.

Harold R. Frasure becomes sales representative in Cincinnati, O., for The New Jersey Zinc Co. and will cover the Columbus, Dayton, and Indianapolis areas as well. **Stanley E. Moore** joins the firm's Chicago, Ill., sales office, and his territory will include the Minneapolis-St. Paul area. **John B. McCarthy** will headquarter at the Los Angeles, Calif., sales office. Walter E. Menhinick, who was in the Chicago office, transfers to St. Louis, Mo., where he will also cover the Kansas City and Louisville areas.

James P. Davidson, John J. McEvoy, and **Robert L. Checkel** take new posts in the market development section, elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Davidson will headquarter in Chicago, Ill.; McEvoy and Checkel will be in Wilmington. Other moves in the department include: **Embert L. Stangor,** technical sales representative, has moved from the Akron district to the central district office in Chicago; **Stanley W. Schmitt,** formerly a technical editor, becomes a technical sales representative assigned to the Trenton, N. J., office in the eastern district, a position formerly held by **James J. Trexel,** who moves to Du Pont (United Kingdom), Ltd., London, England. **William J. Schrantz** has been transferred from Du Pont's Akron laboratory to the Akron district as technical sales representative.

A. Lee Aldridge is now assistant sales manager of The Stalwart Rubber Co., Bedford, O., according to **A. W. MacAlonan,** vice president in charge of sales. In addition to his new executive duties, Aldridge will continue to function in the company's sales estimating department.

J. L. Babcock, formerly comptroller, has been appointed vice president and comptroller, General-Tower, Ltd., Galt, Ont., Canada. Also, **F. W. Graham,** formerly sales manager, becomes vice president-sales, and **G. W. Wright,** formerly plant manager, becomes vice president-production.

Richard D. Rosenberg has been named to head the activities of Dayton Rubber International, a newly created division of The Dayton Rubber Co., Dayton, O. The new division will embrace Dayton's current foreign technical service program as well as the export operations involving product shipments to 45 countries. It is also responsible for Dayton's two foreign operating subsidiaries, at Dundee, Scotland, and Toronto, Ont., Canada. **J. W. Turvey** heads the new division's export department, and the technical service department will be under the supervision of **Ralph Reel.**

Franklin Farrel, III, president of Farrel-Birmingham Co., Inc., Ansonia, Conn., was presented a 25-year company service pin by his father, Franklin Farrel, Jr., who himself was an executive of the firm for 41 years prior to his retirement as chairman of the board in 1945. Franklin Farrel, Jr.'s father, Franklin Farrell, was president of the heavy machinery concern from 1869 to 1912, and he was, as a youth, cofounder of the company, in 1848, with his father, Almon Farrel.

Frederick R. Matthews has been appointed manager of the silicone specialties division, Dow Corning Corp., Midland, Mich. Matthews will continue his duties as manager of the Greensboro, N. C., plant in addition to his new responsibilities and will report to **A. William Rhodes.** Rhodes has been assigned new responsibilities for company planning and will continue as manager of market research. **Louis A. Guglielmo,** assistant to the manager, silicone specialties division, will transfer to Greensboro to continue his responsibilities in the area of product and market development and packaging.

W. W. Thies has been named to assist **F. L. Hopper,** director of the tire production planning and distribution division, The Firestone Tire & Rubber Co., Akron, O. **G. R. Herbig,** operating manager of the production planning department, succeeds Thies as manager of that department. Thies, who joined Firestone in 1944, has held various engineering positions with the company. Herbig has been with the company since 1919.

R. E. Leach has been appointed manager of the Marietta, O., plant of American Cyanamid Co.; while **A. C. Fennimore** becomes manager of the company's Willow Island, W. Va., plant, according to **Wm. H. Bowman,** general manager of the organic chemicals division. **J. W. Dykes,** who managed both locations for more than 10 years, has been named manufacturing management consultant to the division. He expects to retire from Cyanamid later this year, after 41 years of service with the company.

News about People

J. R. Creager

H. H. Fink

J. R. Creager, former production manager of the The Goodyear Tire & Rubber Co.'s Akron, O., chemical plants, has been assigned to the office of vice president of production. In his new post he will work on special projects in connection with chemical plants engineering and will also continue to supervise production operations at Goodyear's Point Pleasant, W. Va., chemical plant. Succeeding Creager is **J. W. Kosko,** former division foreman of Goodyear's Chemigum plant.

Benjamin H. Davis, prominent figure in the development of rubber and plastic extruders and wire insulating machinery, is retiring from active management participation in Davis-Standard Corp. and The Standard Machinery Co., Mystic, Conn. He will continue as a consultant to the two firms. He joined Standard Machinery in 1948 to develop its plastic and rubber extruding equipment and the wire machinery lines. When Davis-Standard was formed to handle the sales of Standard Machinery's products, he was made its operating head and has continued in this capacity. Both companies merged in 1956 with Franklin Research Corp., Boston, and now function as divisions of the Boston firm. Davis became a vice president and a director of Franklin at that time.

R. B. Parks, formerly San Francisco district manager, has been appointed assistant sales manager for industrial rubber products and packings, Raybestos-Manhattan, Inc., Passaic, N. J. A new marketing group section of its sales division has been established. Also, **S. J. Synnott** has been appointed general marketing manager of industrial rubber products and will direct activities of industrial marketing managers assigned to specific product groups.

Morris E. Dry, senior partner in the law firm of Arthur, Dry & Dole, has been appointed general counsel for United States Rubber Co., New York, N. Y., by its board of directors. He was formerly associate general counsel for the company. He replaces **Paul H. Arthur,** who is retiring from the post.

Herbert H. Fink has been named vice president-development of B. F. Goodrich Industrial Products Co., a division of The B. F. Goodrich Co., Akron, O. He joined the company in 1933. In 1944 he was appointed technical manager of suspension design and in 1945, technical manager of the molded goods department. Four years later he was made technical manager of belting, and in 1956 he became manager of hose technical activities, including development and field engineering.

James T. Modawell has been named sales manager, and **Charles E. Lake,** technical representative of The C. P. Hall Co. of California, Los Angeles, Calif. For the past 11 years Modawell has served as office manager and technical representative of the company. Lake will be headquartered in the Los Angeles office covering the Southern California territory.

Jon Charles

Jon Charles

J. T. Modawell C. E. Lake

Roland Reppert has been named to the newly created position of vice president-marketing of American Hard Rubber Co., Butler, N. J. Since 1947 he was vice president-sales and is succeeded by **James P. Coughlin,** formerly with Armour-Alliance Corp., a subsidiary of Armour & Co., where he was general sales manager. Prior to that Coughlin had been divisional sales manager and divisional manager of the electric arc welding division of Westinghouse Electric Corp.

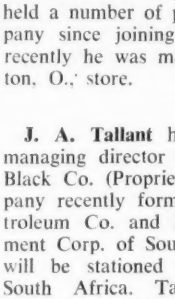
Herbert E. Markley, vice president, foreign operations, The Timken Roller Bearing Co., Canton, O., has announced five promotions in the foreign operations division. **S. C. Partridge,** general manager, industrial division, becomes director of sales, international divisions. **John B. Baker,** chief products engineer, is now chief engineer, international divisions; while **J. Richard Wible,** auditor of the company, has been named general auditor, international divisions. **Edward H. Hughes** has been made manager of sales planning, domestic and international. Manager of production planning, domestic and international, is **Charles L. Richey.**

K. E. Johnson, former group leader, has been named technical supervisor of the fabrics division laboratory, E. I. du Pont de Nemours & Co., Inc., Fairfield, Conn., effective June 30. He succeeds **W. Stewart Gocher,** who has retired after 34 years of service.

N. M. Ingber, analytical chemist, joins Borden Chemical Co.'s central research laboratory, Philadelphia, Pa., as part of an overall research and development program expansion. Others joining the center are **Erwin A. Hoess, John H. Merriam,** and **Ray V. Mihailovich.** Ingber had experience with the U. S. Naval Engineering Experiment Station, the Argonne National Laboratory, and the U. S. Army Chemical Center. Dr. Hoess, formerly with Food Machinery Co., has had experience in research on coal products, wood hydrolysis, rubber, organic chemicals, and monomers. Merriam was with Allied Chemical Corp., where he was supervisor in pilot-plant operation, project evaluation, and process design. Mihailovich, formerly with B. F. Goodrich Research Center, has devoted recent years to the study of polymerization of olefins and polyvinyl chloride.

Arthur E. Patterson, Jr., has been made assistant manager of the auto tire sales department, The Goodyear Tire & Rubber Co., Akron, O. He has held a number of posts with the company since joining it in 1941. Most recently he was manager of the Kenton, O., store.

J. A. Tallant has been appointed managing director of Phillips Carbon Black Co. (Proprietary), Ltd., a company recently formed by Phillips Petroleum Co. and Industrial Development Corp. of South Africa, Ltd. He will be stationed in Port Elizabeth, South Africa. Tallant was rubber chemicals sales division coordinator in Phillips Chemical Co., since 1950. Tallant is succeeded by **C. M. Tucker** as sales coordinator. Tucker, who will be headquartered in Bartlesville, Okla., has been superintendent of the chemical company's Plains copolymer synthetic rubber plant, near Borger, Tex., since 1956.



J. A. Tallant C. M. Tucker

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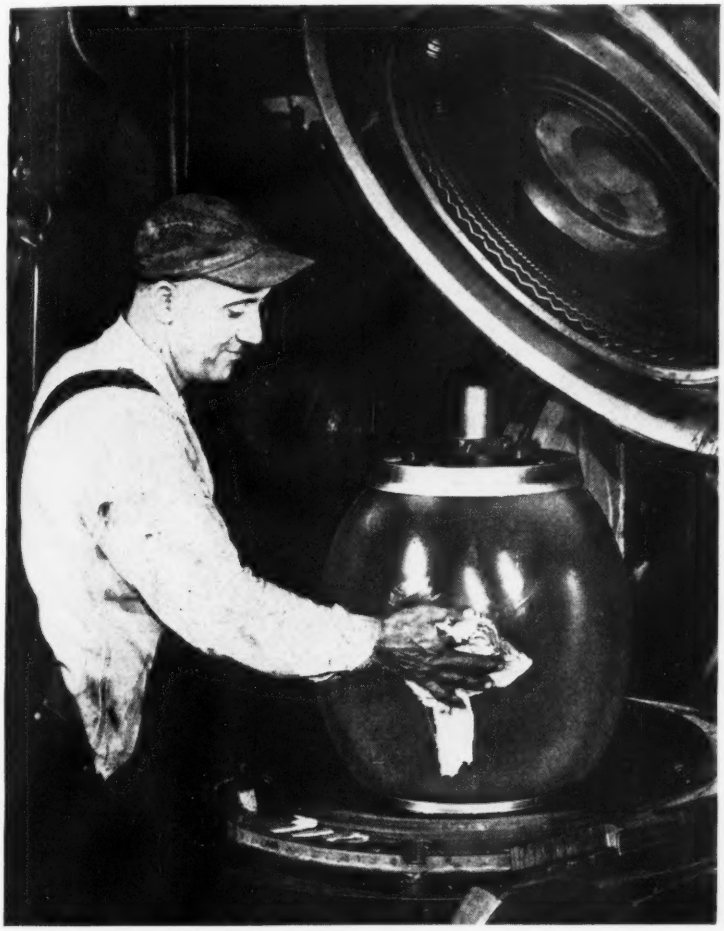

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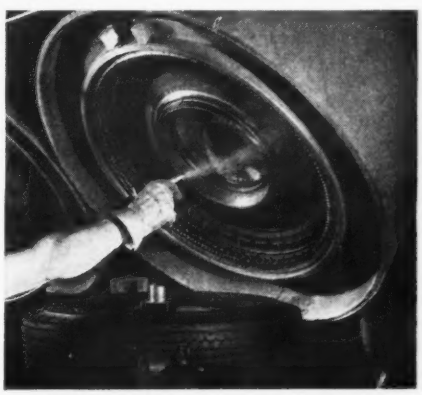

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News about People

E. Schwaegerle

L. E. King

Edward G. Schwaegerle becomes manager of synthetic resin development at the Avon Lake (Ohio) Development Center of B. F. Goodrich Chemical Co., a division of The B. F. Goodrich Co. Formerly development supervisor in charge of vinyl resin development, he joined The B. F. Goodrich Co. in 1942 and was transferred to Avon Lake in 1946 when BFG Chemical began operations there. In 1952 he was promoted to senior technical man and that same year was named development supervisor of the group which has developed most of the vinyl resins now sold by the firm.

James C. E. Fuller has been named plastic resins sales manager of Naugatuck Chemicals, division of Dominion Rubber Co., Ltd., Montreal, P.Q., Canada. Fuller will be responsible for the Canadian sales of Vibrin polyester resins, Vibramix polyester premixes, Kralastic A.B.S. copolymer, and Marvinol vinyl resins. He will headquarter at Elmira, Ont.

John N. Brewster has been named manager of petroleum company sales for B. F. Goodrich Tire Co., a division of The B. F. Goodrich Co., Akron, O. He joined the company in 1946. After a series of sales-management positions in the BFG Atlanta zone, he was transferred to Akron in 1957 as manager of highway truck tire sales.

Julian J. Kliolz, vice president, has been appointed to serve on the board of directors of Associated Gaskets, Inc., Bridgeport, Conn., according to **Victor J. Castaldo,** president. Also, **Joseph J. Locastra** has been named plant superintendent, and **Paul Gordon Ambrose** becomes production manager of the firm which manufactures industrial rubber parts.

Mortimer P. Schester, formerly president of Polytex Adhesives Corp., has joined the market development staff of National Starch & Chemical Corp., New York, N. Y. National will continue the operation of the Polytex facilities at Wallington, N. J., where an expanded line of Polytex adhesives, coatings, and related products will be manufactured.

L. E. King has been appointed manager of The Sid Richardson Carbon Co.'s plants at Odessa, Tex., where he previously had been plant superintendent. Entering the carbon black industry in 1925, he was formerly with United Carbon Co. King will direct Richardson's production activities from the Odessa office.

Harry William Peterson becomes product manager-chemicals, The Enjay Co., Inc., New York, N. Y., replacing **A. C. Matthies,** who will serve on a loan assignment in London, England, until early 1960. **Vernon D. Herbert** takes over Peterson's former post as assistant product manager-chemicals. In his new assignment Peterson will be responsible for manufacturing coordination, technical service, and transportation and distribution for the chemicals division.

John W. Simmons has been elected president of The Wilson Rubber Co., Canton, O., according to **F. S. Dickinson, Jr.,** president of Wilson's parent organization, Becton, Dickinson & Co., Rutherford, N. J. Simmons was executive vice president and secretary of the industrial, linemen's, household, and surgical glove manufacturing company. Prior to his association with Wilson Rubber, Simmons was vice president and general manager of Becton, Dickinson & Co. of Nebraska, a wholly owned subsidiary of the New Jersey concern.

M. G. Huntington, general manager, Associated Lines, B. F. Goodrich Tire Co., Akron, O., will take early retirement on August 15. He is succeeded by **F. H. Newsom,** southern zone manager, Associated Lines, who has been headquartered in Dallas, Tex. Both have been with the company since 1923.

J. R. South has been named product manager of the Dayton Industrial Products Co.'s urethane department, Dayton, O. The firm is a division of The Dayton Rubber Co. He previously was assigned to technical service work on urethane products in the Detroit-Chicago area. He now will be responsible for sales of all flexible and rigid urethane foams as well as Daycollan, a cast urethane with outstanding physical properties.

David S. Clark becomes sales manager of The Surety Rubber Co., Carrollton, O., a leading producer of rubber and synthetic gloves for linemen, industrial and household use. He was general sales manager of R. L. Kuss & Co., from 1957 to 1959. Prior to that time he had served as a division sales manager for Pretty Products, Inc. He was also associated with Edmont Mfg. Co., as assistant to the sales manager and merchandising manager.

Frederick L. Bissinger has been elected to the newly created position of vice president and general manager of Industrial Rayon Corp., Cleveland, O., according to **H. B. Kline,** president. Bissinger previously was group vice president in charge of the company's marketing and research divisions. In his new capacity, his executive responsibilities will be enlarged to cover all phases of the company's operations.

Donald W. Gates was honored for his 20 years' service at a special banquet in Akron, O., by top executives of Associated Tires & Accessories, a division of The B. F. Goodrich Tire Co. Gates, manager, automotive chain store sales for the division, has held various positions since he was selected for BFG's training program in 1939.

W. R. Walton, Jr., vice president of Dunlop Canada, Ltd., Toronto, Ont., Canada, has retired from active executive responsibility in the company, but will remain on the board of directors.

•

Harry M. Naugle

Harry M. Naugle, chairman of the board of The Worthington Ball Co., Elyria, O., passed away on July 14 in Canton, O. He had a distinguished career in the steel and rubber industries.

During the earlier part of his career, from 1907 to 1933, Mr. Naugle had been associated with numerous steel companies including Berger Mfg. Co., National Press Steel Co., Central Steel Co., Columbia Steel Co., American Rolling Mill Co., Naugle & Townsend, Inc., Rotary Electric Steel Co. He was possibly best known in the steel industry for his invention, with the late A. J. Townsend, of the continuous strip rolling process.

In 1934 he became president and general manager of The Worthington Ball Co., in which capacity he served until he became chairman of its board in 1957. He was also a director of Worthington Ball continuously from 1927 until his death.

Recently he retired as a director of the United Engineering & Foundry Co., Pittsburgh, Pa., which position he had held since 1931. He was also a director of Adamson United Co., Akron, O., from the years 1945 to 1958.

The deceased was born in Ligonier, Pa., on September 25, 1884. He attended the University of Pennsylvania and Drexel Institute of Technology.

Mr. Naugle was a member of the Brookside Country Club, Canton, O., the Union Club of Cleveland, O., and a member emeritus of the American Iron & Steel Institute.

He is survived by his wife and a brother.

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MARKET REVIEWS

Natural Rubber

During the period under review (June 16-July 15) the natural rubber market entered a new phase. At the moment attention is focused on the developments in Washington where a bill is before Congress to permit the General Services Administration to dispose, without replacement, of natural rubber, certain oils, and fibers now in excess of current stockpile objective or subject to deterioration. The market has been swayed according to the interpretation it has put on the carefully worded, non-committal announcements which from time to time have been issued, and an uncertain and erratic market resulted.

At recent price levels the market received support from consumers, and some improvement has taken place to which reluctance of sellers has also contributed. The U. S. stockpile problem is a prime factor, and until this question is clarified the market is likely to continue in a state of suspense unless resumed Russian buying on a larger scale should disperse the uncertainty.

June sales, on the New York Commodity Exchange, amounted to 15,310 tons, compared with 25,630 tons for May contract. There were 22 trading days in June, and 21 during the June 16-July 15 period.

REX CONTRACT

	June 19	June 26	July 2	July 10
July	33.75	32.40	33.25	33.90
Sept.	33.85	32.70	33.65	33.90
Nov.	33.50	32.40	33.45	33.70
Jan.	33.40	32.25	33.40	33.60
Mar.	33.30	32.15	33.30	33.50
May	33.10	32.05	33.20	33.35
July	33.00	31.95	33.15	33.25

NEW YORK OUTSIDE MARKET

	June 19	June 26	July 2	July 10
RSS #1	34.25	33.00	33.75	34.38
#2	34.00	32.88	33.63	34.25
#3	33.75	32.63	33.38	34.00
Pale Crepe				
#1 Thick	36.00	35.00	35.88	36.38
Thin	35.75	34.50	35.38	35.88
#3 Amber Blankets	33.00	32.00	32.75	33.50
Thin Brown Crepe	32.88	31.75	32.50	33.13
Standard Flat Bark	29.38	28.50	29.13	29.25

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 33.97¢ per pound for the June 16-July 15 period. Average June sellers' prices for representative grades were: RRS #3, 33.86¢; #3 Amber Blankets, 33.43¢; and Flat Bark, 29.38¢.

Synthetic Rubber

The end of the strikes at the plants of the Firestone Tire & Rubber Co. and The B. F. Goodrich Co. was reflected in the increase in the consumption of new rubber, which rose to 141,895 long tons in June from the 113,392 tons used in May, according to the regular monthly report of The Rubber Manufacturers Association, Inc.

Consumption of all types of synthetic rubber in June increased to 93,325 long tons, compared with May consumption of 74,615 tons. By types in long tons June synthetic consumption, compared with May figures, was as follows: SBR, 77,560, against 60,870; neoprene, 7,150, against 6,914; butyl, 5,500, against 3,978; and nitrile, 3,115, against 2,853.

Exports remained at about the same level in June as in May at 27,000 tons, about 21,000 of which was SBR.

Production of synthetic rubber was cut back in June to 106,705 tons, compared with the 109,951 tons made in May, with SBR and butyl accounting for most of this drop.

M. E. Samuels, of Copolymer Rubber & Chemical Corp., in a talk before the Southern Rubber Group on June 5 reported that there are 25 commercially produced non-dispersant black masterbatches being made by six different companies. Total dispersant and non-dispersant black masterbatches commercially available amount to 100.

It is also of interest to note that black masterbatches which amounted to only 8% of SBR production on a tonnage basis for the first five months of 1958, rose to 13% for the same period in 1959.

A. K. O'Keefe, president, Texas-U. S. Chemical Co., pointed out in a talk in New York in June that one of the SBR industry's most serious problems was the profit squeeze which has resulted from prices stabilized at a low level and increased production and selling costs.

Latex

The latex rubber market was not directly affected by the impending United States stockpile problem, and very steady conditions have prevailed in this market, according to one source. The supply position for nearby shipment has remained extremely tight, and the few production balances that did become available were quickly taken off the market.

Producers of bulk latex appear to be fully committed, at least for the next few months. They apparently have nothing to spare for selling in drums which might otherwise have alleviated the tightness of drum latex for nearby shipment which continues.

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 50.23¢ per pound solids. Synthetic latices prices were 21.5 to 38.2¢ for SBR; 37 to 53¢ for neoprene; and 46 to 60¢ per pound for the nitrile types.

Consumption of latex here in May was 5,429 tons, only slightly lower than for April (5,793 tons). United States stocks at the end of May at 9,718 tons, showed an increase of some 1,200 tons on the month.

Final April and preliminary May domestic figures for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long, Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Apr.	0	6,342	5,793	8,599
May	0	*	5,429	9,718
SBR				
Apr.	6,730	—	5,629	7,859
May	6,583	—	5,962	7,917
Neoprene				
Apr.	1,301	0	1,104	1,458
May	1,146	0	995	1,417
Nitrile				
Apr.	911	0	1,169	2,379
May	1,156	0	1,112	2,398

* Not available yet for period covered.

Scrap Rubber

Fair activity was noted in the scrap rubber market during the June 16-July 15 period, with prices unchanged from previously quoted levels. Some quarters were hopeful activity would hold at its present level, but it was feared trading would sag once the major reclaimers shut down for their annual vacations.

Naugatuck is slated to close the first two weeks of August, and the Buffalo reclaimer is expected to close

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CYURAM*DS	*Pellets Powder*	Tetramethylthiuram Disulfide
CYZATE*B	*50% aqueous dispersion*	Zinc Dibutyl Dithiocarbamate
CYZATE*E	*50% aqueous dispersion*	Zinc Diethyl Dithiocarbamate
ZMBT	*Powder*	Zinc Salt of Mercaptobenzothiazole

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the last weeks of that month. Wage negotiations are slated to open on August 18 at Cleveland between the AFL-CIO United Rubber Workers Union and The Goodyear Tire & Rubber Co., according to one source. The Goodyear talks will cover 23,000 workers in 11 cities.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$7.00	$11.50
S. A. G. truck tires	nom.	17.00
Peeling, No. 1	nom.	26.00
2	nom.	22.00
3	nom.	19.00
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	3.25	3.25
Black	5.75	5.75
Red	6.25	6.25
Butyl	4.50	4.75

Rayon and Nylon

First half year sales figures on nylon tire cord will not be available for a while, but, preliminary, according to a major nylon producer, it appears that the percentage of nylon cord tire sales in the passenger-tire replacement market will hold at about the same as last year, i.e., at the 40% mark. The total market, however, is reported to be growing, so that the unit sales of nylon cord tires will be somewhat higher in the first half of 1959 than at any time during 1958.

In truck tires, both original equipment and replacement, it appears that there will be an increase in nylon sales, both in terms of percentage of the market and in units.

Recently completed tests of nylon cord tires and tires made with Tyrex viscose rayon tire cord substantiate earlier findings about the superiority of nylon in the essential properties of tire cord — impact resistance, heat resistance, flex strength, and moisture resistance, according to one source. One significant fact developed in the most recent tests reveals that although brand-new nylon cord tires hold an advantage of nearly 2:1 over brand-new Tyrex tires in impact resistance, the nylon tires are said to have an advantage of about 17:1 over the Tyrex tires after both types have been run for 15,000 miles on test cars over the highway. In other words, the heat and flexing of 15,000 miles of travel caused a sharp drop in the impact resistance of the Tyrex tires, but the nylon tire cord tires retained a high degree of resistance to impacts.

Total packaged production of rayon and acetate filament yarn during June was 63,900,000 pounds, consisting of 29,000,000 pounds of high-tenacity rayon yarn and 34,900,000 pounds of regular-tenacity rayon yarn. Production for May had been: total, 62,000,000

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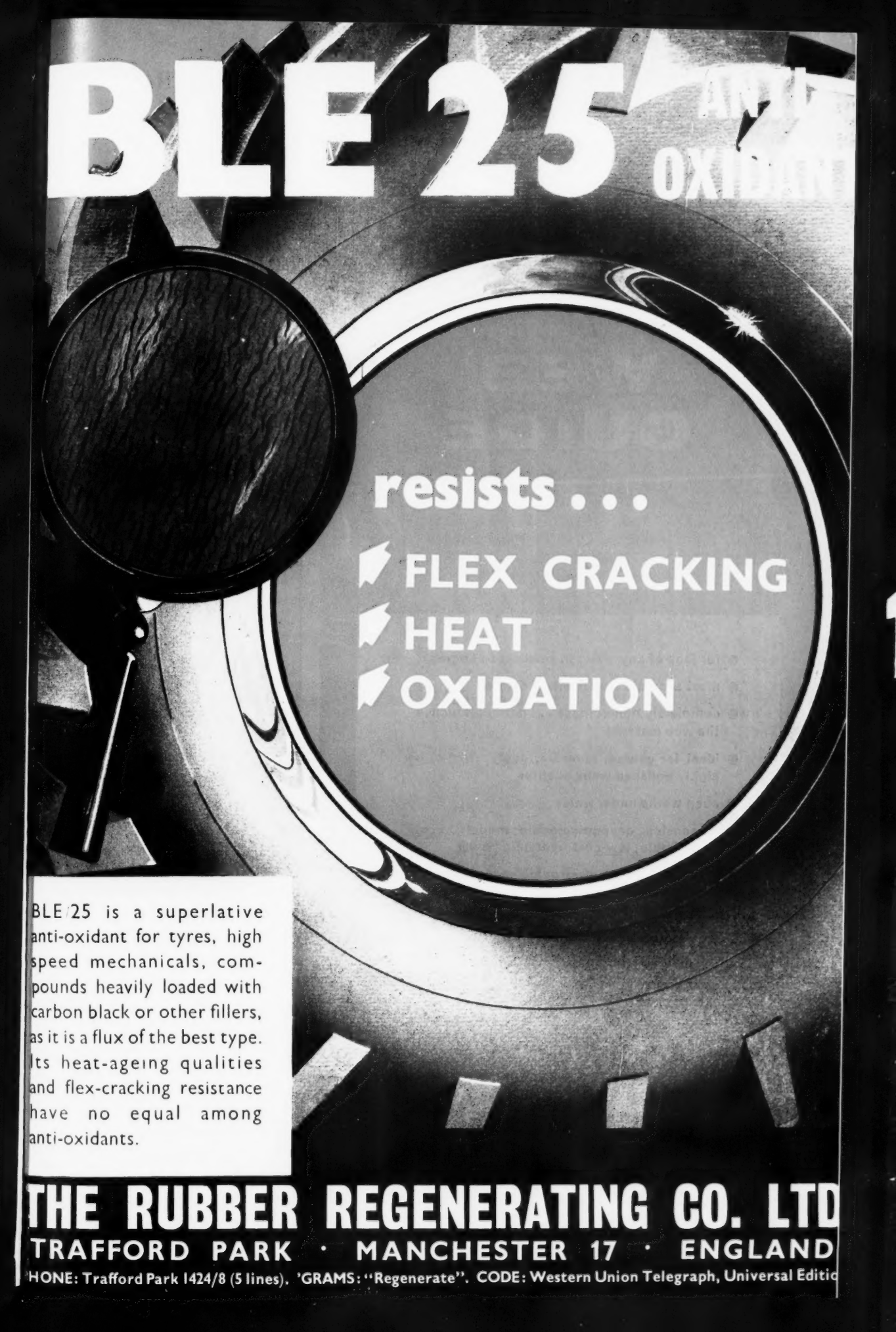

BLE 25 is a superlative anti-oxidant for tyres, high speed mechanicals, compounds heavily loaded with carbon black or other fillers, as it is a flux of the best type. Its heat-ageing qualities and flex-cracking resistance have no equal among anti-oxidants.

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pounds, including regular-tenacity yarn, 34,100,000 pounds, and high-tenacity rayon yarn, 27,900,000 pounds.

Filament yarn shipments to domestic consumers for June totaled 62,900,000 pounds, of which 28,200,000 pounds were high-tenacity rayon yarn, and 34,700,000 pounds were regular-tenacity rayon yarn. Shipments for May had been: total, 61,100,000 pounds; high-tenacity, 27,600,000 pounds; regular-tenacity, 33,500,000 pounds.

There have been no changes in prices of tire cord since the last report.

RAYON PRICES

Tire Fabrics

1100/490/2	$0.625/$0.78
1650/908/2	.685
2200/980/2	.655

Tire Yarns

High-Tenacity	
1100/ 490, 980	.66
1100/ 490	.66
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.60
1900/ 720	.58

NYLON PRICES

Tire Yarns

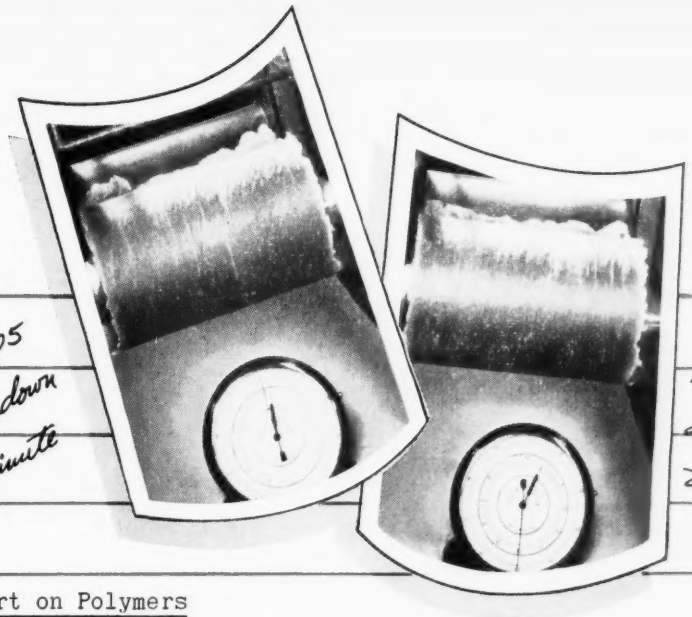
840/140	1.10/ 1.20
1680/280	1.12

Industrial Fabrics

Industrial grey cotton goods were reported quiet during the first part of the period under review (June 16-July 15) because mills included those shut down and others who did so starting with the holiday on July 4. Since mills are comfortably off with booked contracts enough to insure continuous full or almost full spindle and loom operations into and through September and October, with some to spare occasionally to the year-end, the market's tone was relaxed.

Quotations on nearly all wide and heavy constructions are steady for the most part. Underneath the surface of the market there lurks the prospect of quotable price advances once mills get fully under way once more. For there are numerous indications that buyers' needs are greater than their present yardage commitments suggest, according to one source. Otherwise the quiet and casual price and delivery checkings would not include details of available deliveries to the year-end.

A cause for concern comes to notice where enameling duck is involved. An important mill has gone off 38-inch 2.00-yard because Pakistan imports at from 23 to 25¢ a yard compare with



Report on Polymers

ASRC POLYMER 3105 ELIMINATES BREAKDOWN STEP IN PROCESSING

Photographs above show how ASRC 3105 gives head start over competitive polymer 1502 in processing. Rubber and fillers can be introduced simultaneously without breakdown time before mix — with considerable savings in processing time and reduced power costs.

ASRC also offers additional advantages —

1. Absorbs 20–30% more fillers
2. Can be used as softener with other polymers to improve processing of compound
3. Less shrinkage — with high tensile and good tear resistance in sponge rubber
4. Compatible with various resins and plastics
5. Best color available in polymers

Test samples and literature on ASRC 3105 available on request.

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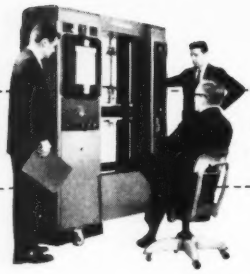

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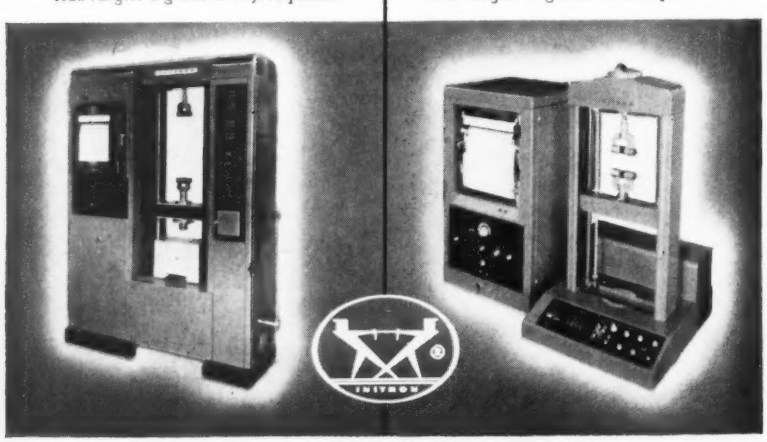


Market Reviews

our production costs of around 27.5¢ a yard, net. There is also a price of 57¢ for imported 72-inch 1.05-yard single filled, which cloth is otherwise priced at 62¢ up by American producers.

Some narrow sheetings, regular and soft filled, are also coming from the Orient at prices which roughly figure from 1.5 to 2¢ a yard below American mills' price levels.

Industrial Fabrics

Broken Twills*

54-inch, 1.14, 76x52	*yd.*	$0.52
58-inch, 1.06, 76x52		.585
60-inch, 1.02, 76x52		.5825

Drills*

59-inch, 1.85, 68x40	*yd.*	.385
2.25, 68x40		.325

Osnaburgs*

40-inch, 2.11, 35x25	*yd.*	.2275
3.65, 35x25		.1525
59-inch, 2.35, 32x26		.295
62-inch, 2.23, 32x26		.305

Ducks

Numbered Duck†

List less 45%

Enameling Ducks*

	S. F	D. F.
38-inch, 1.78 yd.	$0.3263	.3313
2.00 yd.	.275	.28
51.5-inch, 1.35 yd.	.45	.47
57-inch, 1.22 yd.	.4838	.50
61.5-inch, 1.09 yd.	.5413	.5538

Hose and Belting Duck*

Basis	*lb.*	.60

Army Duck†

52-inch, 11.70 oz., 54x40 (8.10 oz./sq.yd.)	*yd.*	.5925

Sheeting*

40-inch, 3.15, 64x64	*yd.*	.2175
3.60, 56x56		.185
52-inch, 3.85, 48x48		.235
57-inch, 3.47, 48x48		.245
60-inch, 2.10, 64x64		.365
2.40, 56x56		.3275

Sateens*

53-inch, 1.12, 96x60	*yd.*	.6275
1.32, 96x64		.56
57-inch, 1.04, 96x60		.615
58-inch, 1.02, 96x60		.68
1.21, 96x64		.61

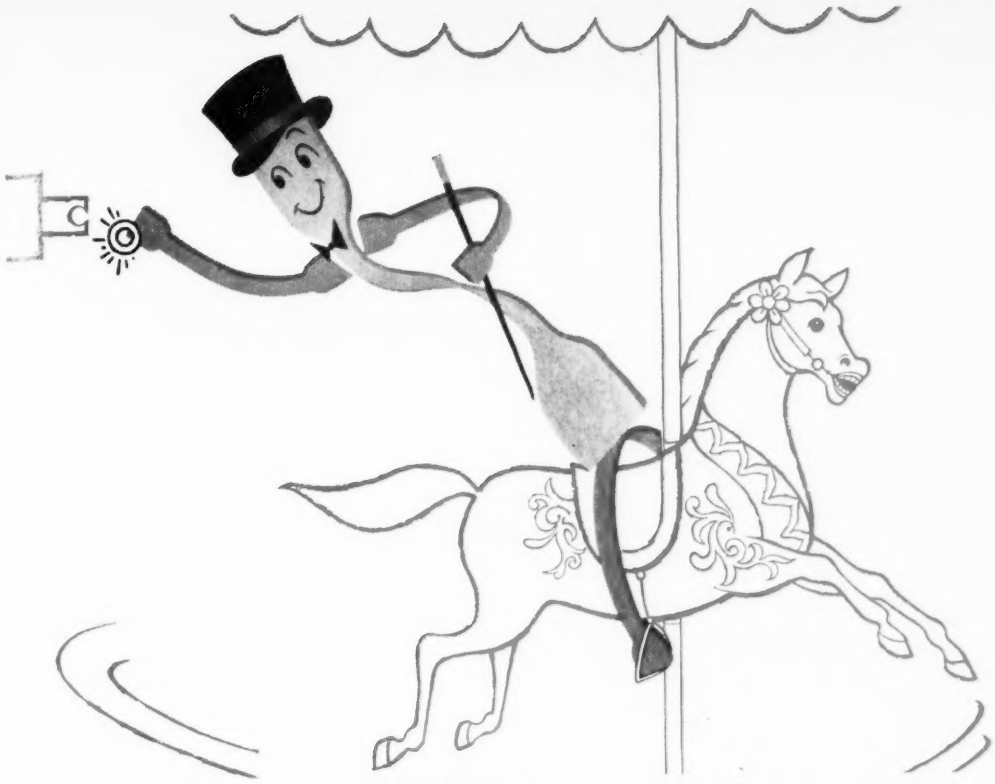
Chafer Fabrics*

14.40-oz./sq.yd. P.Y.	*lb.*	.71
11.65-oz./sq.yd. S.Y.		.61
10.80-oz./sq.yd. S.Y.		.65
8.9-oz./sq.yd. S.Y.		.67
40-inch, 2.56, 35x25		.25
60-inch, 1.71, 35x25		.435

*Net 10 days.
†2% 10 days.

Reclaimed Rubber

Early in the period of June 16-July 15, two of the major reclaimers settled their strikes and returned to work. After a slight lag, this allowed the other reclaimers to settle down to normal levels, according to one source. These levels, however, remain at a much higher plateau than a year ago.



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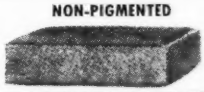
CURRENT PHILPRENE POLYMERS

	NON-PIGMENTED 	PIGMENTED WITH PHILBLACK *
HOT	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1018 PHILPRENE 1019	
COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1601 PHILPRENE 1603** PHILPRENE 1605 **Pigmented with EPC Black
COLD OIL	PHILPRENE 1703 PHILPRENE 1708 PHILPRENE 1712	PHILPRENE 1803 PHILPRENE 6608 PHILPRENE 1805 PHILPRENE 6620 PHILPRENE 6604 PHILPRENE 6661*** PHILPRENE 6682*** ***Carbon black slurry made by Philjet* Process

Bending, stretching and flexing. Philprene rubber can take severe stresses and strains and come up smiling! And because there are so many different polymers to choose from, you can select a Philprene that provides exactly the qualities you need in your product.

Choose from hot, cold, pigmented, non-pigmented and cold oil types. There are non-staining Philprene polymers . . . Philprenes specially adapted for calendering and easy extrusions . . . others that are famous for wear resistance. You name the qualities you want and your Philprene technical representative will tell you which Philprene to use for *best possible results!*

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More pounds per hour
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Here's what a Sargent gives you:

Completely automatic, trouble-free performance. Dependable, quality production. Speediest installation. Least downtime (Sargent's exclusive design means easiest, quickest cleanout). Rugged construction. Incorporates every modern safety device. Designed for steam, extended surface heating elements, electric strip heating, or for added economy in natural gas areas, gas fired, direct or indirect. (Sargent pioneered the first successful gas-fired synthetic rubber dryer.) Advanced engineering by men who respect your requirements — A Sargent is Modern for Years to Come.

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Graniteville, SINCE 1852 Massachusetts

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CHICAGO 44 — John Law & Co., 5850 West Lake St.
DETROIT 27 — Clifford Armstrong Co., 16187 Grand River Ave.
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ATLANTA, GA. — J. R. Angel, Mortgage Guarantee Building
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Market Reviews

Information received indicates that there will be few vacation shutdowns among the tire producers. Both original-equipment and replacement tire companies are reported to be doing better than last year. This trend is carried over into the allied automotive lines.

One of the major reclaimers has reported that since its strike has been settled, there is a very heavy demand for reclaim. The outlook for the future indicates that this company will be busy for quite some time.

Prices remain unchanged during this period.

According to The Rubber Manufacturers Association, Inc., report, June production of reclaimed rubber was 26,900 long tons; while consumption was 25,515 long tons.

Reclaimed Rubber Prices

Whole tire, first line	$0.11
Third line	.1025
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Pelletized News

(*Continued from page 644*)

Russia is said to be showing interest in Indonesian smallholder rubber, and a trial shipment of 500 tons of blanket rubber is to be sent from Sumatra to Russia.

British tire-testing equipment being manufactured for the Russian tire factory at Dnepropetrovsk includes eight full-scale hydraulically operated machines for testing various sizes of tires ranging from normal automobile to giant and earth-mover tires. One of the devices comprises a cornering force machine designed to set up forces resembling those encountered when cornering on the road, as well as features which make it possible to obtain a wide range of measurements under specific conditions.

Italian synthetic rubber is being exported to Russia under the terms of an agreement between the National Hydrocarbon Bureau (E.N.I.), and the Soviet Union, according to which 8,000 tons of synthetic rubber will be shipped to Russia in exchange for 800,000 tons of crude oil. A first shipment of 4,000 tons of rubber left Italy in January, and the balance was to follow soon.

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Established Eastern Manufacturer of Chemicals and Elastomers has several openings. BS or MS in Chemistry or Chemical Engineering required. Experience with elastomers, paints, or plastics desirable. Replies held confidential.

(Our employees know about this advertisement.)

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Experienced rubber chemists to take charge of compounding, development, and research groups on rubber heels, soles, open and closed-cell sponge and mechanicals.
These openings offer tremendous growth opportunities for the right men. Address Box No. 2352, care of RUBBER WORLD.

MANAGER—EXPERIENCED RUBBER AND PLASTIC TRADER, scrap and virgin materials familiar with resources, sales, import and export. Only experienced men with minimum of three years' field experience need apply. Salary and bonus. Address Box No. 2353, care of RUBBER WORLD.

RUBBER COMPOUNDER

Exceptional and permanent position for Chemical Engineer specialist in rubber compounding. Minimum five years' practical productive experience in compounding and processing all type synthetic elastomers and crude rubber.

Modern plant for specialty mechanical rubber part of nationally known multi-million dollar corporation.

Excellent future. All replies confidential. Address Box No. 2354, care of RUBBER WORLD.

RUBBER CHEMIST—CHEMICAL ENGINEER WITH EXPERience in rubber compounding necessary. Progressive industrial rubber plant located in Pennsylvania. Excellent opportunity. Company paid benefits. Submit complete resume including references and salary requirements. All replies confidential. Address Box No. 2355, care of RUBBER WORLD.

SITUATIONS OPEN (Cont'd)

INTERNATIONAL SALES REPRESENTATIVE

Interesting opportunity for rubber chemist in technical sales and supervision of overseas representative and customers of major rubber chemicals producer. Location New York City. Includes foreign travel. Send resume with references to Box No. 2358, care of RUBBER WORLD.

RUBBER CHEMIST—EXPERIENCE PREFERABLY IN CONVEYor belting—knowledge of solvent and latex cements helpful. Age about 28-32. Eastern location in pleasant surroudings, pension and good fringe benefits. Send résumé, including salary requirement and marital status. Address Box No. 2360, care of RUBBER WORLD.

TECHNICAL SALES REPRESENTATIVE

This outstanding chemical sales organization serving the rubber industry offers excellent opportunity for graduate chemist or chemical engineer under 31 years of age having 5 to 7 years diversified experience in rubber compounding and processing. Applications held in strict confidence. Send résumé to G. E. Popp, PHILLIPS CHEMICAL COMPANY, 318 Water Street, Akron 8, Ohio.

CHEMICAL ENGINEER

Graduate Chemical Engineer. Product Development Work Plastics and Elastomers—similar experience desirable, but not necessary. Send résumé and salary desired: E. L. Bixby, GOODALL RUBBER CO., Trenton 4, N. J.

RUBBER CHEMIST

Rubber Chemist with 3-5 years' experience in compounding and processing of elastomers wanted by manufacturer of rubber and plastics chemicals. Excellent opportunity for advancement. Write or call E. V. Osberg, NATIONAL POLYCHEMICALS, INC., Wilmington, (Boston) Mass., WElls 3-4240.

RUBBER CHEMIST

Young man with two or three years' experience compounding for molded rubber goods. Permanent position with opportunity for advancement medium sized plant located in Central Massachusetts. Salary commensurate with experience. Send résumé. Replies Confidential. Address Box No. 2365, care of RUBBER WORLD.

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Substantial growth in demand for our products has created an opening which offers exceptional potential to the right man—to build a territory and the rewards that go with it.

WE SEEK a man between 25-35, preferably a graduate chemical engineer, with experience in rubber technology and selling to call on industrial rubber users in New England (Conn. and Western Mass. excepted).

WE ARE a leading (established 1832) producer of rubber materials for industry with a research minded outlook. Full cooperation is assured.

Compensation is open. Comprehensive benefits program includes a pension plan.

Send complete resumé to M. E. Yeoman, Personnel Dir.

ROGERS CORPORATION
ROGERS, CONNECTICUT

STATISTICS of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1958						
Aug.	5,140	5,474	892	1,103	7,469	12,609
Sept.	5,034	6,165	1,075	1,173	8,413	13,447
Oct.	6,994	7,617	1,170	1,308	10,095	17,089
Nov.	4,074	7,307	1,156	1,205	9,668	13,744
Dec.	7,950	6,891	986	1,033	8,910	16,860
1959						
Jan.	8,574	7,801	1,049	1,104	9,954	18,528
Feb.	5,746	7,578	998	1,161	9,737	15,483
Mar.	7,039	8,587	1,013	1,269	10,869	17,908
Apr.	6,342	6,730	1,301	911	8,942	15,284
May*	....	6,583	1,146	1,156	8,885	.....

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1958						
Aug.	39,380	59,825	4,277	5,935	2,364	111,781
Sept.	44,743	65,256	4,725	6,647	2,538	123,909
Oct.	48,875	73,699	4,982	7,378	2,759	137,693
Nov.	43,031	66,294	4,419	6,448	2,562	122,754
Dec.	46,891	71,731	4,897	6,955	2,606	133,080
1959						
Jan.	49,913	74,222	5,359	7,198	2,857	139,549
Feb.	47,345	72,558	5,256	6,885	2,694	134,738
Mar.	51,991	78,792	5,687	7,444	3,166	147,080
Apr.	41,483	64,547	4,758	7,493	2,941	121,222
May*	38,777	60,870	3,978	6,914	2,853	113,392

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1958						
Aug.	13,750	7,166	1,195	2,049	10,410	24,160
Sept.	12,482	6,842	1,354	2,096	10,292	22,774
Oct.	10,324	7,129	1,365	2,229	10,723	21,047
Nov.	8,795	7,810	1,498	2,530	11,838	20,633
Dec.	8,900	7,672	1,563	2,519	11,754	20,654
1959						
Jan.	10,025	7,822	1,551	2,418	11,791	21,816
Feb.	10,482	7,753	1,488	2,535	11,776	22,258
Mar.	9,375	8,209	1,441	2,670	12,320	21,695
Apr.	8,599	7,859	1,458	2,379	11,696	20,295
May*	9,718	7,917	1,417	2,398	11,732	21,450

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1958				
Aug.	22,432	19,347	900	27,961
Sept.	22,641	21,771	1,005	26,676
Oct.	26,524	23,563	1,028	27,340
Nov.	22,450	21,271	1,051	27,680
Dec.	24,800	23,285	841	29,063
1959				
Jan.	25,790	25,002	1,157	27,157
Feb.	25,290	24,471	1,041	27,504
Mar.	29,310	27,869	1,375	27,582
Apr.	21,671	22,380	1,225	25,131
May*	19,401	20,496	980	23,554

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1958					
Aug.	8,521	972	2,603	558	12,654
Sept.	8,802	812	2,774	518	12,906
Oct.	12,292	1,407	2,547	553	16,799
Nov.	11,872	1,306	3,010	639	16,827
Dec.	12,634	1,258	2,484	520	16,896
1959					
Jan.	11,962	1,579	3,430	520	17,491
Feb.	11,615	1,169	2,404	648	15,836
Mar.	16,295	2,238	2,712	467	21,712
Apr.	19,154	2,135	2,741	527	25,557
May	21,281	2,587	2,942	642	27,452

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1958					
Aug.	136,735	24,618	16,344	6,224	183,921
Sept.	138,987	22,554	15,154	6,145	182,840
Oct.	134,613	22,091	15,474	6,356	178,534
Nov.	140,673	20,192	15,373	7,273	183,511
Dec.	143,533	18,770	15,488	7,292	185,083
1959					
Jan.	147,243	16,827	15,638	7,335	187,043
Feb.	148,606	16,339	15,990	7,468	188,403
Mar.	146,971	14,441	14,701	7,753	183,866
Apr.	147,867	12,496	14,848	7,728	182,939
May*	156,209	12,710	15,024	7,820	191,763

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

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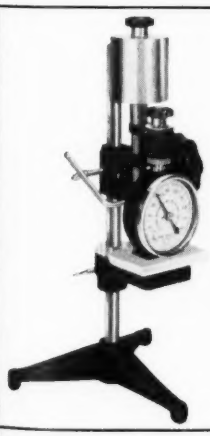

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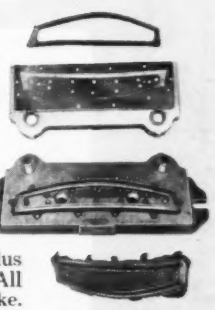

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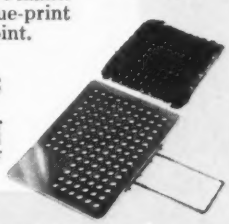

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World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1958						
Mar.	38.2	31.6	16.9	73.7	122.2	160.0
Apr.	36.6	43.0	13.4	72.8	115.6	165.0
May	36.0	28.7	14.7	71.6	100.3	152.5
June	37.6	43.7	16.1	74.6	129.9	172.5
July	34.2	27.9	12.7	74.0	115.8	152.5
Aug.	39.4	33.4	8.7	60.6	102.7	145.0
Sept.	44.8	49.3	16.8	78.7	145.2	187.5
Oct.	48.9	40.5	14.2	82.1	136.8	185.0
Nov.	43.1	32.7	14.2	78.4	125.3	167.5
Dec.	47.0	46.5	17.0	76.8	140.5	187.5
1958 Total	485.2	427.0	175.5	895.8	1,497.3	1,982.5
1959						
Jan.	50.0	49.6	15.3			192.5
Feb.	47.3	29.8	13.8	77.7	117.5	167.5
Mar.	52.0	19.0	15.3	78.8	117.7	165.0
Apr.	41.5	...	13.9	...	...	...

* Estimated.

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the International Rubber Study Group.

World Production of Natural Rubber

(1,000 Long Tons)

Year	Malaya Estate	Malaya Native	Indonesia Estate	Indonesia Native	All Other	Total
1958						
Jan.	35.8	25.4	22.5	11.5	167.5	72.3
Feb.	28.8	22.9	20.0	8.8	145.0	64.5
Mar.	28.4	20.3	19.7	27.5	147.5	51.6
Apr.	26.7	18.3	16.8	24.0	140.0	54.2
May	27.2	18.2	17.7	20.1	145.0	61.8
June	31.2	21.9	19.7	26.0	155.0	56.2
July	36.5	23.8	20.8	45.3	175.0	48.6
Aug.	34.0	24.8	19.5	42.9	172.5	51.3
Sept.	33.8	23.6	19.0	38.6	167.5	52.5
Oct.	35.1	23.7	20.1	43.4	175.0	52.7
Nov.	31.9	19.8	20.1	43.3	170.0	54.9
Dec.	41.5	30.1	21.5	45.8	195.0	56.1
1958 Total	390.9	272.7	237.4	377.1	1,955.0	676.9
1959						
Jan.	37.6	27.2	20.3	22.4	82.5	190.0
Feb.	27.9	21.2	18.0	29.5	58.4	145.0
Mar.	28.5	21.1	17.4	40.3	45.2	152.5
Apr.	28.9	19.4	15.5	...	...	...

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1958					
Mar.	66.0	3.5	6.6	13.8	97.5
Apr.	66.6	3.8	4.7	13.5	95.0
May	66.3	4.0	5.5	13.3	95.0
June	69.8	4.5	6.0	13.8	100.0
July	63.9	3.9	4.7	13.5	92.5
Aug.	71.8	3.0	3.1	10.3	95.0
Sept.	78.5	4.2	5.8	14.0	110.0
Oct.	88.0	4.1	4.8	14.8	120.0
Nov.	79.0	4.3	5.2	13.8	110.0
Dec.	85.4	4.3	6.2	13.8	115.0
1958 Total	872.2	46.7	63.0	173.0	1,225.0
1959					
Jan.	89.6	4.4	5.8	15.5	122.5
Feb.	87.4	5.2	5.7	15.5	122.5
Mar.	95.1	5.0	7.0	15.8	130.0
Apr.	79.7	5.1	6.2	...	115.0

*Includes latices.

† Figures estimated or partly estimated.

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1958				
Mar.	83.6	11.3	1.2	96.2
Apr.	73.8	11.1	1.1	85.9
May	76.4	11.2	1.2	88.8
June	74.1	10.2	1.1	85.4
July	77.1	11.2	2.6	91.0
Aug.	87.3	10.9	2.3	100.5
Sept.	90.9	11.5	2.2	104.7
Oct.	100.9	12.5	2.4	115.9
Nov.	102.5	12.1	3.1	117.7
Dec.	101.6	12.9	2.7	117.3
1958 Total	1,052.8	135.0	22.7	1,210.5
1959				
Jan.	108.5	13.0	2.0	123.5
Feb.	102.3	11.7	2.3	116.3
Mar.	111.4	7.5	3.7	122.6
Apr.	108.5	...	3.5	111.9

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1958						
Mar.	39,885	69,230	4,698	7,671	2,042	123,526
Apr.	41,278	59,263	4,324	7,973	2,197	115,035
May	36,183	62,161	4,462	7,450	2,338	112,594
June	28,279	62,567	1,926	7,251	2,306	102,329
July	25,823	64,944	3,698	6,248	2,193	102,906
Aug.	39,057	73,338	4,455	6,745	2,783	126,378
Sept.	41,343	75,111	4,117	8,586	3,165	132,322
Oct.	45,136	82,741	5,338	9,283	3,619	136,022
Nov.	41,819	84,382	4,145	10,394	3,575	134,647
Dec.	54,491	85,270	3,933	9,201	3,217	156,112
1959						
Jan.	54,950	90,261	4,992	9,991	3,260	163,454
Feb.	48,917	83,067	5,650	10,256	3,324	151,214
Mar.	48,584	91,847	6,056	9,690	3,784	159,961
Apr.	44,347	88,444	6,279	10,455	3,299	152,824
May*	....	89,625	6,467	10,249	3,610	.....

*Preliminary.

Source: Bureau of the Census, Industry Division, Chemicals Branch, United State Department of Commerce.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	SBR	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1958						
Mar.	5,560	4,708	633	720	6,061	11,621
Apr.	4,847	4,093	707	797	5,597	10,444
May	5,004	4,102	785	795	5,682	10,686
June	5,304	4,165	639	919	5,723	11,027
July	4,531	3,433	629	703	4,765	9,296
Aug.	6,094	4,654	764	1,025	6,443	12,537
Sept.	6,748	5,779	820	1,017	7,616	14,364
Oct.	7,725	6,534	979	1,120	8,633	16,358
Nov.	6,540	6,009	798	1,108	7,915	14,455
Dec.	6,820	6,893	805	1,106	8,804	15,624
1959						
Jan.	7,184	6,886	925	1,244	9,055	16,239
Feb.	6,489	7,083	859	1,009	8,951	15,440
Mar.	7,052	7,275	1,054	1,208	9,537	16,589
Apr.	5,793	5,629	1,104	1,169	7,902	13,695
May*	5,429	5,962	995	1,112	8,069	14,966

* Preliminary.

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

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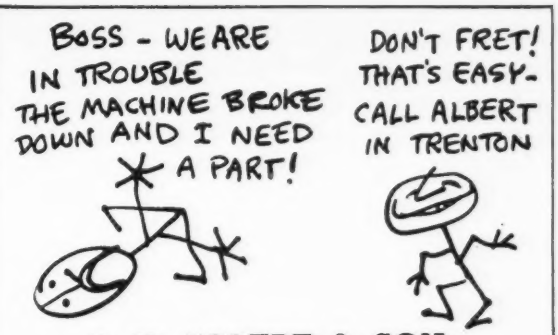

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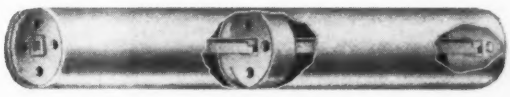

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UNITED RUBBER MACHINERY EXCHANGE
183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

Carbon Black Statistics—Jan.-May, 1959

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

Furnace types	Jan.	Feb.	Mar.	Apr.	May
Production					
Thermal	12,187	11,675	12,469	14,293	14,443
SRF	23,004	21,767	23,108	22,957	23,728
HMF	6,487	5,169	5,694	6,810	5,412
GPF	5,000	5,545	6,942	7,937	8,723
FEF	21,579	19,286	23,372	21,683	20,925
HAF	39,114	37,892	46,534	43,315	45,057
SAF	293	—	—	—	1,656
ISAF	16,605	14,490	19,262	19,770	18,365
Total furnace	124,269	118,824	137,381	136,265	138,309
Contact types	26,890	24,695	28,029	27,624	27,752
Totals	151,159	143,519	165,410	164,389	166,061
Shipments					
Thermal	12,283	12,658	14,904	13,223	12,313
SRF	26,251	26,009	29,465	24,244	21,012
HMF	6,420	5,122	6,299	5,895	5,748
GPF	6,977	7,245	7,397	8,336	8,375
FEF	24,511	20,924	25,949	19,575	17,558
HAF	45,800	42,890	47,161	40,675	32,238
SAF	615	583	897	553	946
ISAF	17,391	16,739	19,859	18,934	19,133
Total furnace	141,248	132,170	151,931	131,435	117,323
Contact types	31,852	28,221	29,214	24,453	26,386
Totals	172,100	160,391	181,145	155,888	143,709
Producers' Stocks, End of Period					
Thermal	23,181	22,198	19,759	20,829	22,959
SRF	35,764	31,522	25,165	23,979	26,842
HMF	6,856	6,903	6,298	7,169	6,686
GPF	7,658	5,958	5,503	5,104	5,452
FEF	17,213	15,575	12,998	15,106	18,473
HAF	38,010	33,012	32,382	35,018	47,837
SAF	5,071	4,487	3,586	3,028	3,738
ISAF	38,708	39,459	38,862	39,698	38,930
Total furnace	172,461	159,114	144,553	149,931	170,917
Contact types	88,646	85,120	83,935	87,098	88,368
Totals	261,107	244,234	228,488	237,029	259,285
Exports					
Total furnace	29,543	19,442	30,154	29,600	—
Contact types	15,604	12,930	13,037	11,702	—
Totals	45,147	32,372	43,191	41,302	—

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1956	1957	1958	1959	1956	1957	1958	1959
Jan.	415	496	448	508	935	1,047	1,100	1,013
Feb.	445	495	413	490	970	1,036	1,087	1,032
Mar.	451	476	412	506	979	1,030	1,112	1,030
Apr.	445	490	429	...	970	1,031	1,047	....
May	464	481	428	...	985	1,024	1,020	....
June	450	458	445	...	975	1,027	986	....
July	459	514	478	...	987	1,045	980	....
Aug.	436	481	438	...	1,007	1,074	1,024	....
Sept.	429	481	464	...	1,007	1,074	1,024	....
Oct.	454	490	493	...	1,022	1,097	1,022	....
Nov.	463	431	472	...	1,024	1,101	1,018	....
Dec.	461	427	518	...	998	1,092	994	....
Total	5,372	5,720	5,438	...	Av. 988	12,678	12,414	....

* Adjusted for seasonal variation.
Source: Office of Business Economics, United States Department of Commerce.

U.S.A. Rubber Industry Economic Indicators

	Production Index*					% Return†	
Year	All Rubber Products	Total Tires & Tubes	Auto Tires	Truck & Bus Tires	Miscellaneous Rubber Products	On Sales	On Investment
1956	133	121	123	119	144	4.5	9.0
1957	135	123	134	107	147	4.2	8.5
1958							
Jan.	123	106	111	99	140		
Feb.	120	112	118	104	127		
Mar.	118	108	115	98	128	3.0	5.2
Apr.	115	103	112	91	125		
May	112	102	113	88	121		
June	122	117	131	99	127	3.4	6.4
July	103	96	105	85	108		
Aug.	127	110	118	99	142		
Sept.	137	117	122	109	156	4.5	9.2
Oct.	143	129	131	125	156		
Nov.	145	128	131	124	160		
Dec.	137	128	132	122	146	4.5	9.6
1959							
Jan.	150	138	149	124	161		
Feb.	158	154	167	137	161		
Mar.	159	155	171	133	163		
Apr.	138	111	120	99	163		

* F.R.B. Index of Industrial Production Unadjusted (1947-49 Avg., 100%).
† Base Data F.T.C.-S.E.C.-Quarterly Financial Reports—% Calculated by RMA.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1958			
Apr.	108.14	40.2	2.69
May	110.03	40.6	2.71
June	112.61	41.1	2.74
July	111.52	40.7	2.74
Aug.	112.75	41.0	2.75
Sept.	113.98	41.0	2.78
Oct.	114.67	41.1	2.79
Nov.	117.88	41.8	2.82
Dec.	120.56	42.3	2.85
1959			
Jan.	121.56	42.4	2.86
Feb.	118.53	41.3	2.87
Mar.	118.08	41.0	2.88

Source: BLS, United States Department of Labor.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

(Thousands of Pounds)

	Cotton and Nylon*			
	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Rayon Tire Cord and Tire Cord Fabric	Total All Tire Cord and Fabrics
1958				
Jan.-Mar.	9,750	18,820	66,830	167,924
Apr.-June	7,890	24,725	†	80,533
July-Sept.	7,999	24,904	†	91,984
Oct.-Dec.	10,533	26,392	71,827	107,532
1959				
Jan.-Mar.	9,163	32,402	77,307	122,661

* Cotton and nylon figures combined to avoid disclosing data for individual companies.
† Not available.
Source: Bureau of the Census, United States Department of Commerce.

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U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121.0	$27.84	39.9	$0.75	
1958					
Jan.	200.9	87.48	38.2	2.29	122.3
Feb.	191.3	85.04	37.3	2.28	122.5
Mar.	184.0	87.02	38.0	2.29	123.5
Apr.	176.0	85.88	37.5	2.29	123.6
May	172.3	87.86	38.2	2.29	123.7
June	175.8	91.10	39.1	2.33	123.9
July	175.1	91.89	39.2	2.35	123.7
Aug.	181.2	96.80	40.5	2.39	123.7
Sept.	187.5	97.51	40.8	2.39	123.7
Oct.	194.5	97.27	40.7	2.39	123.7
Nov.	195.3	98.09	40.7	2.41	123.9
Dec.	198.2	102.66	41.9	2.45	123.7
1959					
Jan.	199.1	100.28	41.1	2.44	123.8
Feb.	198.8	101.09	41.6	2.43	123.7
Mar.	202.0	103.32	42.0	2.46	123.7
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1958					
Jan.	81.6	98.52	36.9	2.67	
Feb.	78.5	93.02	35.1	2.65	
Mar.	76.0	98.05	37.0	2.65	
Apr.	72.1	95.67	36.1	2.65	
May	70.4	99.48	37.4	2.66	
June	71.2	103.63	38.1	2.72	
July	71.0	106.59	38.9	2.74	
Aug.	72.5	113.96	40.7	2.80	
Sept.	74.1	113.40	40.5	2.80	
Oct.	75.3	113.24	40.3	2.81	
Nov.	76.2	115.75	40.9	2.83	
Dec.	77.1	121.40	42.3	2.87	
1959					
Jan.	76.9	117.55	41.1	2.86	
Feb.	76.2	118.98	41.6	2.86	
Mar.	78.1	123.54	42.6	2.90	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1958					
Jan.	17.5	74.87	39.2	1.91	
Feb.	17.0	74.68	39.1	1.91	
Mar.	16.7	76.61	39.9	1.92	
Apr.	16.5	75.46	39.3	1.92	
May	16.3	75.85	39.3	1.93	
June	16.3	77.20	40.0	1.93	
July	15.9	75.25	39.4	1.91	
Aug.	16.4	77.18	40.2	1.92	
Sept.	16.8	76.62	39.7	1.93	
Oct.	17.1	77.01	39.9	1.93	
Nov.	17.2	77.22	39.6	1.95	
Dec.	17.1	78.01	39.8	1.96	
1959					
Jan.	17.1	78.20	39.9	1.96	
Feb.	17.1	80.59	40.7	1.98	
Mar.	17.4	79.79	40.3	1.98	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1958					
Jan.	101.8	80.94	39.1	2.07	
Feb.	95.8	80.32	38.8	2.07	
Mar.	91.3	79.87	38.4	2.08	
Apr.	87.4	79.87	38.4	2.08	
May	85.6	80.29	38.6	2.08	
June	88.3	83.77	39.7	2.11	
July	88.2	83.53	39.4	2.12	
Aug.	92.3	86.24	40.3	2.14	
Sept.	96.6	89.21	41.3	2.16	
Oct.	102.1	88.78	41.1	2.16	
Nov.	101.9	88.54	40.8	2.17	
Dec.	104.0	92.60	41.9	2.21	
1959					
Jan.	105.1	91.27	41.3	2.21	
Feb.	105.5	91.96	41.8	2.20	
Mar.	106.5	92.38	41.8	2.21	

Source: BLS, United States Department of Labor.

U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
Passenger Car						
1958						
Apr.	1,594	5,517	61.4	7,173	6,522	19,051
May	1,874	5,593	55.8	7,523	6,715	18,263
June	1,667	6,387	62.8	8,117	7,306	17,465
July	1,756	6,502	60.0	8,318	6,368	15,490
Aug.	847	5,807	57.2	6,711	6,753	15,535
Sept.	1,170	5,425	63.9	6,659	7,134	16,045
Oct.	1,522	5,369	80.6	6,972	7,983	17,134
Nov.	3,056	3,651	57.7	6,765	7,182	17,420
Dec.	3,701	3,977	61.2	7,739	8,046	17,818
1959						
Jan.	2,631	6,028	56.9	8,716	8,859	17,998
Feb.	2,442	4,932	60.2	7,434	8,962	19,435
Mar.	2,930	6,261	61.7	9,253	9,959	20,181
Apr.	3,115	6,390	64.8	9,569	6,986	17,597
May	2,848	5,617	38.4	8,504	6,953	15,721
Truck and Bus						
1958						
Apr.	282	666	55	1,002	955	3,607
May	299	626	54	980	938	3,571
June	265	794	54	1,113	988	3,456
July	265	940	51	1,255	920	3,114
Aug.	208	871	57	1,136	1,009	2,986
Sept.	273	940	41	1,253	1,143	2,880
Oct.	316	1,106	59	1,482	1,361	2,779
Nov.	313	669	42	1,023	1,211	2,983
Dec.	356	734	63	1,153	1,330	3,171
1959						
Jan.	329	714	47	1,090	1,325	3,401
Feb.	364	679	74	1,117	1,308	3,584
Mar.	406	842	56	1,304	1,391	3,680
Apr.	479	907	44	1,430	1,039	3,276
May	442	738	41	1,222	945	3,006
Total Automotive						
1958						
Apr.	1,876	6,183	116	8,175	7,477	22,658
May	2,173	6,220	110	8,503	7,652	21,834
June	1,932	7,182	117	9,231	8,293	20,920
July	2,020	7,442	111	9,573	7,288	18,604
Aug.	1,055	6,679	115	7,848	7,762	18,521
Sept.	1,442	6,365	105	7,912	8,277	18,925
Oct.	1,838	6,476	140	8,454	9,344	19,913
Nov.	3,369	4,320	100	7,788	8,393	20,403
Dec.	4,057	4,711	124	8,892	9,376	20,988
1959						
Jan.	2,961	6,742	104	9,806	10,184	21,399
Feb.	2,805	5,611	135	8,551	10,270	23,019
Mar.	3,336	7,103	117	10,557	11,350	23,862
Apr.	3,594	7,297	108	10,999	8,025	20,872
May	3,291	6,356	79	9,726	7,796	18,727

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1958						
Aug.	160	3,097	74	3,331	3,305	7,664
Sept.	207	3,228	63	3,498	3,390	7,657
Oct.	244	3,237	84	3,567	3,768	7,869
Nov.	264	2,575	60	2,899	3,319	8,372
Dec.	288	3,029	94	3,411	3,491	8,617
1959						
Jan.	287	4,450	63	4,800	3,806	7,536
Feb.	311	3,924	81	4,316	4,094	7,364
Mar.	339	4,013	83	4,435	4,459	7,629
Apr.	389	3,473	65	3,928	3,380	7,218
May	363	2,853	59	3,275	2,752	6,849

Source: The Rubber Manufacturers Association, Inc.

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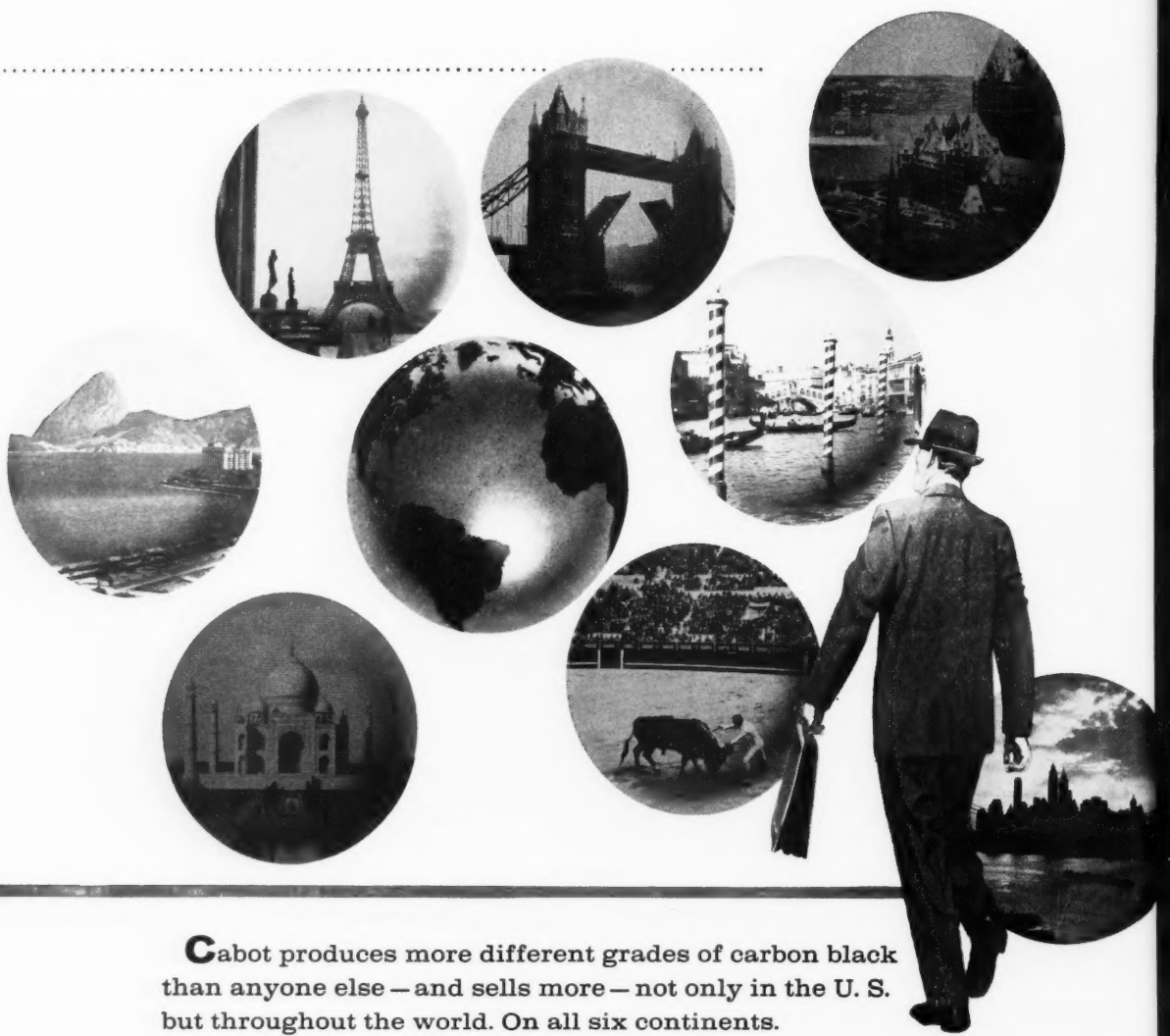

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